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HAMILTON, ONTARIO

# 1984 HAMILTON-WENTWORTH COLLISION REPORT

PREPARED BY:
THE CITY OF HAMILTON TRAFFIC DEPARTMENT

# 1984 HAMILTON-WENTWORTH COLLISION REPORT

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# 1984 HAMILTON-WENTWORTH MOTOR VEHICLE COLLISION REPORT

## Introduction

This annual report is a summary of factors associated with traffic collisions that occurred in the Regional Municipality of Hamilton-Wentworth in 1984.

Traffic collisions are a primary cause of accidental deaths (Appendix Exhibits A-1, A-2, and A-3), injuries and associated property losses. The intention of this report is to provide factual information to those agencies and persons concerned with the safety of the roadway transportation system within the Regional Municipality of Hamilton-Wentworth.

Traffic collisions frequently involve complex interactions between human behavior, vehicle characteristics, and the environment. The factor or factors responsible for causing a collision are not always the most obvious nor are they always readily apparent. Caution should be exercised in drawing conclusions from the statistics presented in this report and conclusions should be drawn only with appropriate qualifications and supportive information.

## Additions Incorporated Into the 1984 Collision Report

For 1984, the Hamilton-Wentworth Collision Report has an added special features section. As there are areas of research interest for which it is not possible to produce automated reports, the collision report will, starting with the 1984 report, feature special analyses performed by hand. This year, the focus is on non-reportable bicycle accidents.

In Hamilton, collisions involving a bicycle are only considered reportable if the cyclist was involved in a collision with a motor vehicle on the public roadway. Thus, collisions such as those involving two cyclists, those involving a cyclist with a pedestrian, or those involving a cyclist with a motor vehicle on private property are not considered reportable, and are not included in analyses such as Figure 3-15 in this report. Any collision involving less than $400 property damage without personal injury occurring is also not included.

As the following exhibit shows, there were a total of 36 non-reportable collisions involving bicycles in 1984 in Hamilton-Wentworth. One-third of these (12) involved a cyclist and a motor vehicle in which no injury occurred. While occasional comments are received about bicycles interfering with pedestrians, only five collisions were reported to the Hamilton-Wentworth Regional Police involving a bicycle colliding with a pedestrian.

1984 Non-Reportable Bicycle Accidents

| Collision Involved | Collision Occurred On: Private Property | Regional Property | Total |
|---|---|---|---|
| One Cyclist | 0 | 7 | 7 |
| More Than One Cyclist | 0 | 2 | 2 |
| Cyclist With Pedestrian | 0 | 5 | 5 |
| Cyclist with Motor Vehicle | 8 | 12 | 20 |
| Cyclist With Parked Motor Vehicle | 2 | 0 | 2 |
| TOTAL | 10 | 26 | 36 |

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# 1984 HAMILTON-WENTWORTH COLLISION REPORT

**Summary:**

* In 1984, 7,228 reportable traffic collisions occurred on municipal roadways in the Region of Hamilton-Wentworth. These collisions resulted in:-

- 12 driver or passenger fatalities (5 motor vehicle drivers, 4 motorcyclists, 1 bicyclist and 2 riders or passengers)
- 6 pedestrian fatalities
- 3,535 driver, bicyclist or passenger injuries
- 320 pedestrian injuries
- 20,475 persons (equal to approximately 5 percent of the Regional population) being involved in a reportable traffic collision in 1984
- approximately 14.5 million dollars in property damages (as estimated at the time of the collision)
- 43 million dollars (estimated) in damages when all collision costs including medical costs, loss of income and other related costs are taken into account (see Note 2.3)

* The overall frequency of collisions in Hamilton-Wentworth is generally lower than other major Canadian municipalities.

* The overall frequency rates of fatalities in the City of Hamilton are generally lower than other Canadian and U.S. cities of similar population.

* The period from 12 midnight to 5 a.m. exhibits the highest ratio of collisions to vehicle volume using the street system.

* The greatest causes of traffic collisions were driver or pedestrian error; either errors in judgement or perception, or non-observance of traffic regulations.

* The predominant improper driver actions indicated in collisions were "following too close" and "failure to yield right-of-way".

* Drivers under 20 years of age were involved in a disproportionate number of collisions relative to the number of drivers in this age group that are licenced to drive. This age group was involved in 9.3 percent of the reported collisions although it comprises only 7.2 percent of the licenced driving population.

* Ten and one-tenth percent of reported collisions involved one or more drivers who had been drinking.

* Alcohol was associated with a high proportion of collisions (36 percent) which occurred in the hours between 10 p.m. and 3 a.m. from Wednesdays to Sundays and in night-time collisions (23.6 percent of collisions between 6 p.m. and 6 a.m.).

Note: These figures are indicative of alcohol being present in the bloodstream of one or more of the drivers involved in the collision and do not necessarily suggest that alcohol was the proximate cause of the collision.

* Non-licenced drivers were less likely to be driving properly, and more likely to be under the influence of alcohol or drugs when involved in a collision.

* Motorcycle operators were more likely to be driving properly at the time of the collision and more likely to receive injuries if involved in a traffic collision.

* Children between 5 and 9 years of age were involved in a disproportionate number of pedestrian collisions (16.0%) compared with their proportion of the regional population (7.2%). Pedestrians in this age group were most frequently involved in a collision as the result of entering the roadway unexpectedly; that is, running into the roadway or entering the roadway from behind a parked vehicle or object.

* Vehicle defects were reported in 1 percent of the vehicles involved in collisions. It should be noted that the presence of a recorded vehicle defect does not necessarily suggest that it was the proximate cause of the collision.

## 1984 COMPARED WITH PREVIOUS YEARS

A comparison of the collision statistics for 1984 with those for previous years indicates noticable differences in four areas as follows.

### 1. Overall Collisions

Forty fewer collisions (0.6%) occurred in 1984 than in 1983. The number of vehicle collisions occurring in the Regional Municipality of Hamilton-Wentworth was the lowest recorded for the Region since the Region was formed in 1974. Consistent with this reduction in collisions, the occurrence of injury collisions, persons injured and fatalities in the Region were all lower by between 4.0 percent and 10.0 percent compared to 1982.

### 2. Bicycle Injuries

The number of people injured in motor vehicle collisions while riding on a bicycle dropped from 202 in 1983, to 178 in 1984. For the years 1979, 1980, 1981 and 1982, by comparison, the number of cyclists involved in collisions was 190, 182, 165 and 254 respectively.

### 3. Pedestrian Collisions Involving Five to Nine Year Olds

Collisions involving five to nine year old pedestrians declined from 79 in 1983 to 51 in 1984, a decrease of thirty-five percent. For comparison, data for the years 1979 through 1982 were 92 collisions, 90 collisions, 72 collisions and 107 collisions respectively.

### 4. Sixteen to Nineteen Year Old Involvement

The 16 - 19 year old age group of drivers is much less likely to be driving properly when involved in a collision than the overall average. However, in 1984, this age group was involved in fewer collisions per capita than in 1983 and was no more likely to be involved in a collision than the 20 - 24 year old group.

In 1984, sixteen to nineteen year old drivers were involved in fewer motor vehicle collisions following the consumption of alcohol than in 1983. However, collisions involving 16 year olds who had been drinking rose from 1 to 2, and collisions involving 17 year olds who had been drinking rose from 3 to 10.

# Chapter One
# Trends

## General

Since 1951, the number of motor vehicle collisions and persons injured in motor vehicle collisions in Hamilton and Hamilton-Wentworth has increased (Exhibits 1-4, 1-5, 1-6). However, in the same time period, the population of the reporting area has approximately doubled and motor vehicle registrations have risen by a factor of 3 (Appendix Exhibit A-4). There is also evidence to suggest that, with an improving highway system, each registered vehicle is driven a greater distance annually. The effect of increased population, vehicle registration and vehicle use is increased opportunity for motor vehicle collisions to occur.

## Normalizing the Data

To fairly assess historical trends, collision data should be expressed in terms of rate (normalized) through the use of one of several factors. Annual motor vehicle use information would provide the most accurate assessment of a motorist's exposure, and hence, likelihood of involvement in a collision. Motor vehicle registration data is somewhat less accurate as a normalizing factor, but is utilized since exposure information is not available. Rates based on registration data should be examined with caution, as the reliability of the registration information is unknown.

Population also provides a suitable and accurate normalizing factor. Exhibits 1-1, 1-2, 1-3 and associated analysis in this chapter refer to data which has been calculated on a population rate basis.

## Collisions

The overall motor vehicle collision rate is shown in Exhibit 1-1. As of January 1, 1978, the reporting level for property damage only collisions was raised from $200.00 to $400.00. In 1984 the overall number of collisions was approximately .6 percent lower than in 1983.

Due to changes in the reporting criteria and reporting area for the period for which historical data are available, trend analysis of the number of collisions would not be appropriate or meaningful.

Personal injury collisions (Exhibit 1-1) show a significant (at the 99 percent level) decline from 1965 to 1984.

The results of this regression analysis and others for data in this chapter are included in Appendix Exhibit A-7.

## Injuries

The personal injury rate graph (Exhibit 1-2), parallels the closely related injury collision graph (Exhibit 1-1). From 1951 to 1984 a significant increase in the personal injury rate is noted, while from 1963 to 1984 a slight decrease (statistically significant at the 95 percent level) is shown.

The rate of occurrence of pedestrian injuries (Exhibit 1-2) has demonstrated a modest but consistent decrease from 1951 to 1984.

## Fatalities

In 1984, eighteen persons died in motor vehicle collisions in Hamilton-Wentworth.

Since fatal collisions are rare events, small changes in the number of fatalities cause large fluctuations in the fatality rate (Exhibit 1-3). These fluctuations reduce the validity of statistical tests. Thus while the fatality rate for all collisions shows a slight downward trend, especially since 1968, this trend is not statistically significant. The overall fatality rate thus appears unchanged during the past 31 years. Comparable patterns are evident for Ontario and Canada (Appendix Exhibit A-5).

The fatality rate for pedestrians does display a reduction which is significant over the last 31 years.

## Alcohol Involvement

When viewed as a proportion of overall collisions, statistics pertaining to alcohol involvement have remained quite constant over the period 1977 - 1984. The percentage of collisions in which one or more drivers was reported to have consumed alcohol has averaged approximately 12 percent. Nearly 22 percent of fatal collisions over the eight year period involved a drinking driver. The proportion of all drivers who had been drinking or were impaired when involved in a collision has dropped from 8.3 percent in 1978 to 6.3 percent in 1984 (see Exhibit 3-6). In 1984, 16 - 20 year olds comprised 10.0 percent of the Hamilton-Wentworth population and were involved in approximately 15 percent of collisions after consuming alcohol.

Exhibit 1-1

**TRAFFIC COLLISION RATES - 1951 TO DATE**
**PERSONAL INJURY COLLISION RATES - 1954 TO DATE**

Exhibit 1-2

## PERSONAL INJURY RATES IN TRAFFIC COLLISIONS
## 1951 TO DATE

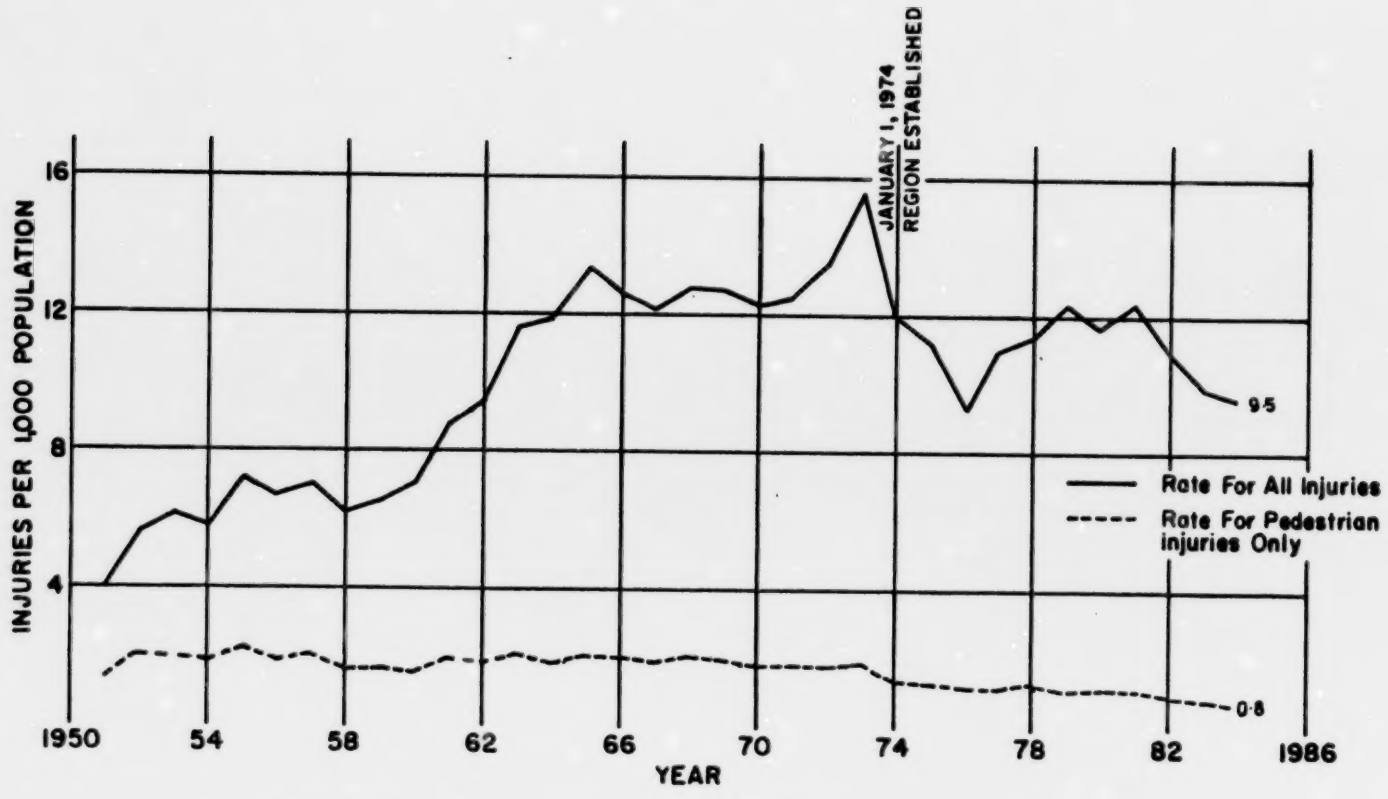

Exhibit 1-3

FATALITY RATES IN TRAFFIC COLLISIONS - 1951 TO DATE

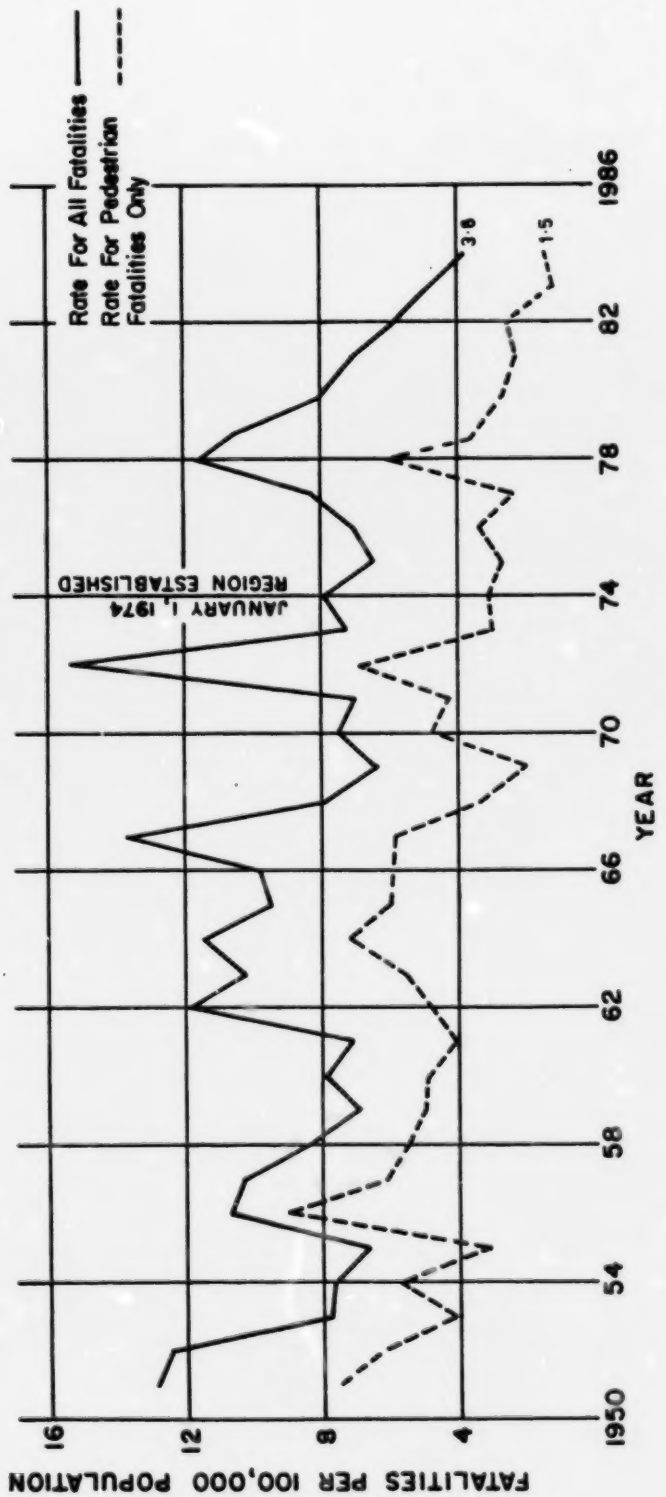

Exhibit 1-4

## COLLISION STATISTICS - HISTORIC TRENDS

| Year | Total No. of Collisions | Fatal Collisions | Injury Collisions | Property Damage Collisions | Estimated Total Property Damage ($) |
|---|---|---|---|---|---|
| 1947 | 1,052 | N/A | N/A | N/A | 209,965 |
| 1948 | 1,351 | N/A | N/A | N/A | 312,170 |
| 1949 | 1,745 | N/A | N/A | N/A | 378,235 |
| 1950 | 2,304 | N/A | N/A | N/A | 522,535 |
| 1951 | 3,421 | N/A | N/A | N/A | 752,185 |
| 1952 | 4,219 | N/A | N/A | N/A | 892,329 |
| 1953 | 4,114 | N/A | N/A | N/A | 974,290 |
| 1954[a] | 4,787 | 16 | 1,070 | 3,701 | 841,762 |
| 1955 | 6,691 | 13 | 1,297 | 5,381 | 1,014,339 |
| 1956 | 7,528 | 25 | 1,222 | 6,281 | 1,169,797 |
| 1957 | 7,973 | 25 | 1,376 | 6,572 | 1,382,399 |
| 1958 | 6,898 | 21 | 1,260 | 5,617 | 1,274,017 |
| 1959 | 7,189 | 18 | 1,337 | 5,834 | 1,388,015 |
| 1960 | 7,763 | 20 | 1,496 | 6,247 | 1,742,296 |
| 1961[a] | 7,547 | 18 | 1,744 | 5,785 | 1,851,000 |
| 1962 | 8,338 | 28 | 1,904 | 6,406 | 2,160,000 |
| 1963 | 9,554 | 27 | 2,309 | 7,218 | 2,560,000 |

| | | | | | |
|---|---|---|---|---|---|
| 1964 | 9,948 | 32 | 2,455 | 7,461 | 2,886,000 |
| 1965 | 10,783 | 26 | 2,789 | 7,968 | 3,413,000 |
| 1966 | 9,950 | 27 | 2,757 | 7,166 | 3,521,000 |
| 1967 | 9,106 | 35 | 2,575 | 6,496 | 3,327,000 |
| 1968 | 8,983 | 21 | 2,547 | 6,415 | 4,449,000 |
| 1969 | 9,589 | 19 | 2,721 | 6,849 | 3,999,000 |
| 1970(a) | 7,799 | 23 | 2,676 | 5,100 | 3,918,000 |
| 1971 | 7,314 | 22 | 2,821 | 4,471 | 4,647,000 |
| 1972 | 8,065 | 39 | 2,901 | 5,125 | 5,464,000 |
| 1973 | 8,499 | 23 | 3,143 | 5,333 | 6,208,000 |
| 1974(b) | 9,599 | 29 | 3,364 | 6,206 | 7,886,000 |
| 1975 | 9,354 | 24 | 3,219 | 6,111 | 8,243,000 |
| 1976 | 9,146 | 28 | 2,816 | 6,302 | 9,262,000 |
| 1977 | 10,011 | 33 | 3,182 | 6,796 | 10,514,000 |
| 1978(a) | 8,636 | 45 | 3,246 | 5,345 | 12,064,000 |
| 1979 | 8,798 | 39 | 3,389 | 5,370 | 13,325,000 |
| 1980 | 8,305 | 33 | 3,253 | 5,019 | 13,708,000 |
| 1981 | 8,660 | 28 | 3,398 | 5,234 | 15,536,040 |
| 1982 | 7,663 | 23 | 2,939 | 4,701 | 13,750,100 |
| 1983 | 7,268 | 20 | 2,839 | 4,409 | 13,924,500 |
| 1984 | 7,228 | 18 | 2,726 | 4,484 | 14,494,300 |

(a) Collision reporting criteria changed (See Page 4).

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit 1-5 **PERSONAL INJURIES AND FATALITIES - HISTORIC TRENDS**

| Year | Total No. of Collisions | Persons Injured | Injury Rate/ 1,000 Pop. | Persons Killed | Death Rate/ 100,000 Pop. | Death Rate/ 10,000 Registered Vehicles |
|---|---|---|---|---|---|---|
| 1947 | 1,052 | 563 | N/A | 26 | N/A | N/A |
| 1948 | 1,351 | 671 | N/A | 19 | N/A | 5.34 |
| 1949 | 1,745 | 738 | N/A | 29 | N/A | N/A |
| 1950 | 2,304 | 760 | N/A | 12 | N/A | 2.55 |
| 1951 | 3,421 | 815 | 4.0 | 26 | 12.9 | 5.13 |
| 1952 | 4,219 | 1,174 | 5.6 | 26 | 12.4 | 4.71 |
| 1953 | 4,114 | 1,322 | 6.1 | 17 | 7.8 | 2.84 |
| 1954[(a)] | 4,787 | 1,304 | 5.8 | 17 | 7.6 | 2.71 |
| 1955 | 6,691 | 1,618 | 7.2 | 15 | 6.6 | 2.22 |
| 1956 | 7,528 | 1,570 | 6.7 | 25 | 10.7 | 3.57 |
| 1957 | 7,978 | 1,703 | 7.0 | 25 | 10.3 | 3.46 |
| 1958 | 6,898 | 1,573 | 6.2 | 21 | 8.4 | 2.77 |
| 1959 | 7,189 | 1,671 | 6.5 | 18 | 6.9 | 2.24 |
| 1960 | 7,763 | 1,871 | 7.1 | 21 | 7.9 | 2.54 |
| 1961[(a)] | 7,547 | 2,311 | 8.7 | 19 | 7.1 | 2.22 |
| 1962 | 8,338 | 2,542 | 9.5 | 32 | 11.9 | 3.82 |
| 1963 | 9,554 | 3,075 | 11.6 | 27 | 10.2 | 3.03 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1964 | 9,948 | 3,305 | 11.9 | 32 | 11.5 | 3.43 | |
| 1965 | 10,783 | 3,824 | 13.4 | 27 | 9.5 | 2.64 | |
| 1966 | 9,950 | 3,746 | 12.6 | 28 | 9.8 | 2.60 | |
| 1967 | 9,106 | 3,484 | 12.2 | 39 | 13.7 | 3.63 | |
| 1968 | 8,983 | 3,573 | 12.8 | 22 | 7.9 | 1.89 | |
| 1969 | 9,589 | 3,768 | 12.7 | 19 | 6.4 | 1.64 | |
| 1970[a] | 6,759 | 3,717 | 12.3 | 23 | 7.5 | 2.00 | |
| 1971 | 7,314 | 3,876 | 12.5 | 23 | 7.0 | 1.91 | |
| 1972 | 8,065 | 4,055 | 13.5 | 46 | 15.3 | 3.42 | (b) |
| 1973 | 8,499 | 4,951 | 15.5 | 23 | 7.2 | 1.63 | |
| 1974[c] | 9,599 | 4,678 | 11.9 | 31 | 7.9 | 2.00 | (b) |
| 1975 | 9,354 | 4,474 | 11.2 | 26 | 6.5 | 1.60 | (b) |
| 1976 | 9,146 | 3,811 | 9.3 | 29 | 7.1 | 1.78 | (b) |
| 1977 | 10,011 | 4,513 | 11.0 | 34 | 8.3 | 2.00 | (b) |
| 1978[a] | 8,636 | 4,635 | 11.4 | 47 | 11.6 | 2.06 | (d) |
| 1979 | 8,798 | 4,923 | 12.1 | 42 | 10.3 | 2.20 | (d) |
| 1980 | 8,305 | 4,800 | 11.7 | 33 | 8.0 | 1.43 | (d) |
| 1981 | 8,660 | 5,015 | 12.3 | 31 | 7.6 | 1.16 | (d) |
| 1982 | 7,663 | 4,175 | 10.3 | 27 | 6.6 | 0.91 | |
| 1983 | 7,268 | 4,041 | 9.9 | 20 | 4.9 | N/A | |
| 1984 | 7,228 | 3,855 | 9.5 | 18 | 3.8 | N/A | |

(a) Collision reporting criteria changed (See Page 4).

(b) Registration estimated from total Ontario registrations.

(c) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

(d) Registration data from licence information.

Exhibit 1-6

## COLLISIONS WITH ALCOHOL INVOLVEMENT
## HISTORIC TRENDS

| Year | Total Number of Reported Collisions | Number of Alcohol-Related Motor Vehicle Collisions(a) | % Alcohol-Related | Total Number of Fatal Collisions | Total Number of Fatalities | Number of Alcohol-Related Motor Vehicle Fatal Collisions(a) |
|---|---|---|---|---|---|---|
| 1977 | 10,011 | 1,175 | 11.7 | 33 | 34 | 5 |
| 1978 | 8,636 | 1,128 | 13.1 | 45 | 47 | 11 |
| 1979 | 8,798 | 1,139 | 12.9 | 39 | 42 | 5 |
| 1980 | 8,305 | 929 | 11.2 | 33 | 33 | 11 |
| 1981 | 8,660 | 1,053 | 12.2 | 28 | 31 | 8 |
| 1982 | 7,663 | 895 | 11.7 | 23 | 27 | 3 |
| 1983 | 7,268 | 765 | 10.5 | 20 | 20 | 5 |
| 1984 | 7,228 | 729 | 10.1 | 18 | 18 | 5 |
| TOTAL 1977-1984 | 66,569 | 7,813 | 11.7 | 239 | 252 | 53 |

(a) Includes drivers classified as impaired due to alcohol or classified as had been drinking.

(b) Section of Canadian Criminal Code.

| Number of Drivers Impaired or Had Been Drinking | Number of Drivers Under 21 Years of Age Impaired or Had Been Drinking | % Under 21 Years of Age | Number of Charges Under Sections 234, 235, 236, 237 C.C.(b) | Number of Charges Under Sections 234-237 C.C. To Drivers Under 21 Years of Age | % Under 21 Years of Age | Year |
|---|---|---|---|---|---|---|
| 1,179 | 241 | 20.4 | 364 | 54 | 14.8 | 1977 |
| 1,169 | 258 | 22.1 | 379 | 53 | 14.0 | 1978 |
| 1,194 | 264 | 22.1 | 382 | 59 | 15.4 | 1979 |
| 953 | 178 | 18.7 | 303 | 56 | 18.5 | 1980 |
| 1,269 | 208 | 16.4 | 369 | 49 | 13.3 | 1981 |
| 918 | 174 | 19.0 | 319 | 49 | 15.4 | 1982 |
| 775 | 144 | 18.6 | 241 | 35 | 14.5 | 1983 |
| 741 | 111 | 15.0 | 308 | 29 | 9.4 | 1984 |
| 8,198 | 1,578 | 19.2 | 2,665 | 384 | 14.4 | TOTAL 1977-1984 |

Exhibit 1-7

## PEDESTRIAN AND CYCLIST INJURIES HISTORIC TRENDS

| YEAR | PEDESTRIAN | | BICYCLIST | |
|---|---|---|---|---|
| | Injuries | Fatalities | Injuries | Fatalities |
| 1947 | 141 | 21 | N/A | N/A |
| 1948 | 204 | 13 | N/A | N/A |
| 1949 | 271 | 18 | 43 | - |
| 1950 | 239 | 11 | 69 | 1 |
| 1951 | 284 | 15 | 89 | - |
| 1952 | 448 | 13 | 116 | 1 |
| 1953 | 464 | 9 | 113 | 1 |
| 1954 | 439 | 13 | 129 | 1 |
| 1955 | 517 | 7 | 141 | 1 |
| 1956 | 447 | 21 | 123 | 1 |
| 1957 | 526 | 15 | 124 | 2 |
| 1958 | 446 | 14 | 100 | 2 |
| 1959 | 456 | 13 | 120 | 1 |
| 1960 | 422 | 13 | 120 | 2 |
| 1961 | 522 | 11 | 112 | 1 |
| 1962 | 495 | 13 | 126 | 1 |
| 1963 | 558 | 15 | 120 | 1 |
| 1964 | 526 | 20 | 120 | - |
| 1965 | 582 | 17 | 140 | - |
| 1966 | 618 | 17 | 132 | 1 |
| 1967 | 537 | 17 | 113 | - |
| 1968 | 588 | 10 | 84 | 1 |
| 1969 | 602 | 6 | 91 | 2 |
| 1970 | 586 | 14 | 101 | 1 |
| 1971 | 570 | 13 | 155 | 2 |
| 1972 | 530 | 21 | 156 | 2 |
| 1973 | 569 | 9 | 197 | 1 |
| 1974(a) | 555 | 13 | 192 | 3 |
| 1975 | 513 | 11 | 235 | - |
| 1976 | 480 | 14 | 195 | - |
| 1977 | 503 | 10 | 193 | 3 |
| 1978 | 542 | 25 | 162 | 1 |
| 1979 | 464 | 15 | 177 | 4 |
| 1980 | 434 | 12 | 178 | 1 |
| 1981 | 458 | 10 | 159 | 1 |
| 1982 | 396 | 10 | 252 | 2 |
| 1983 | 387 | 5 | 200 | 2 |
| 1984 | 314 | 6 | 175 | 1 |

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

# Chapter Two
# Selected Characteristics

**Injuries**

Of the 20,475 persons involved in collisions, 3,855 received injuries. The chance of an involved person sustaining an injury in a collision varied from a 16 percent chance for a motor vehicle rider or passenger to a 100 percent chance for a pedestrian (Exhibit 2-1). Although the risk of injury would appear to be significantly higher for motorcyclists, bicyclists and pedestrians, this phenomenum is partially or wholly explained by the reporting criteria. It is unlikely that a cyclist or pedestrian would be involved in a collision that resulted in over $400.00 damage without the cyclist or pedestrian being injured. Small or exposed vehicles such as bicycles also afford less protection in a collision.

**Seatbelts**

Although motor vehicle seatbelts were reported as being in use for 92 percent of involved drivers (Exhibit 2-2), field observations taken by the Province of Ontario in 1978 (2.1) suggest an actual usage rate for drivers in the order of 65 percent. This discrepancy could be interpreted to mean that a higher proportion of seatbelt users were involved in collisions, but is more likely to indicate an over-statement of seatbelt usage by persons involved in collisions. The involved individual may be concerned about receiving a summons for failure to wear his or her seatbelt or may be concerned about additional financial or civil responsibilities caused by failure to wear belts at the time of the collision.

**Motorcycle Injuries**

Eighty-seven percent of motorcyclists involved in collisions received injuries, compared to 19 percent of all persons involved in collisions. This is indicative of the limited protection afforded to motorcycle riders involved in a collision.

Fifty-seven of 262 (22%) motorcyclists involved in collisions were reported as not wearing helmets, despite the Provincial law mandating helmet use (Exhibit 2-3).

Helmet use did not appear to have an effect on the likelihood of a motorcyclist being injured in a collision. Helmets are intended to prevent head injury, but in a serious collision, the motorcycle rider is equally likely to receive injuries to other parts of the body.

**Damages**

Total damages in collisions in Hamilton-Wentworth amounted to a sum of approximately 14.5 million dollars (Exhibit 2-4), which includes damage to vehicles and property but does not include medical and hospital expenses, loss of income, or loss of future earnings. The estimated cost of property damage of each collision was $2,005 with 56 percent of the vehicles involved sustaining damage in excess of $600 (Exhibit 2-5). When the costs of medical attention, lost income and other effects are considered, the total cost of each collision may exceed $5,947 (2.3).

**Times of Occurrence**

A close similarity between the occurrence of collisions and traffic volumes, on a time of day basis (Exhibit 2-6), was observed. However, the collision rate (in terms of traffic volume) was greater than the daily average during the period from midnight to 5 a.m., when 671 or 9.3 percent of all collisions occurred.

The pattern of collision occurrences by time of day and day of week was summarized (Exhibit 2-7 and Exhibit 2-8), and distinct differences were found in the pattern of collision occurrence.

The explanation for variations in patterns of collisions by time of day and day of week may be associated with difference in travel patterns which change during the week due to the frequency of shopping or personal trips, or with psychological factors such as different drinking and stress patterns that might influence collision involvement.

The pattern of collision occurrences was compared on a month of year basis (Exhibit 2-9) and there was a difference between the number of collisions which occurred each month. The higher number of collisions occurring during the winter months is probably primarily due to drivers not adjusting to adverse weather and roadway conditions.

**Impact Types**

The type of initial impact was compared with the injury classification of the collisions (Exhibit 2-10) and it was determined (at the 95 percent level) that the probability of injury was not the same for all initial impact types.

The chance of being injured in an approaching or single motor vehicle collision was 44 to 55 percent compared to a 15 to 48 percent chance for other collision types. However, fewer approaching and single motor vehicle collisions resulted in injuries or fatalities (775 versus 1,969) than other collision types.

**Impact Types (Cont'd)**

Greater than one half of all collisions were in intersections or associated with intersections (Exhibit 2-11). Twenty-six percent of collisions occurred at signalized intersections, and 22 percent at stop- or yield-controlled intersections (Exhibit 2-12).

Over one half of all collisions occurred at locations with no form of traffic control.

## REFERENCES

2.1 Based on surveys conducted by the Ministry of Transportation and Communications of Ontario, July 1978.

2.2 Ontario Ministry of Health: The cost of hospital and medical treatment for a person injured while wearing seatbelts is $282; for those not wearing belts, $419.

2.3 J. J. Lawson, in "The Cost of Road Accidents and Their Application in Economic Evaluation of Safety Programs" estimated that, in 1978, the average cost of a motor vehicle collision was $4,500.00 for the direct costs of property damage, lost productive work and health care costs only. The 1978 cost was adjusted to $3,593.00 to more accurately reflect the severity and type of collisions which occur in Hamilton-Wentworth. Based on the Consumer Price Index, the comparable value for 1984 is $5,947.00 per collision.

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Exhibit 2-1 **INJURY STATUS OF ALL PERSONS INVOLVED**

| Category | Persons Involved | Persons Injured or Killed | Injuries/ Involved | TYPE OF INJURY Fatal | Major | Minor | Minimal |
|---|---|---|---|---|---|---|---|
| Driver | 12,196 | 2,109 | 0.17 | 9 | 121 | 707 | 1,272 |
| Bicyclist | 178 | 176 | 0.99 | 1 | 18 | 61 | 96 |
| Rider/Passenger | 7,781 | 1,250 | 0.16 | 2 | 63 | 425 | 760 |
| Pedestrian | 320 | 320 | 1.00 | 6 | 46 | 155 | 113 |
| Totals | 20,475 | 3,855 | 0.19 | 18 | 248 | 1,348 | 2,241 |

**THERE WAS APPROXIMATELY A 2 IN 10 CHANCE THAT A PERSON INVOLVED IN A TRAFFIC COLLISION WOULD BE INJURED.**

**FOR EVERY 20 RESIDENTS OF THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH, APPROXIMATELY 1 PERSON WAS INVOLVED IN A MOTOR VEHICLE COLLISION IN 1984.**

Exhibit 2-2

## DRIVER INJURY STATUS VS SAFETY EQUIPMENT IN USE

| Driver Injury Status | SAFETY EQUIPMENT IN USE | | | | |
|---|---|---|---|---|---|
| | All | Pelvic Only | None | Unknown | Total |
| None | 9,251 | 120 | 322 | 419 | 10,112 |
| Minimal | 1,149 | 21 | 77 | 29 | 1,276 |
| Minor | 589 | 4 | 78 | 38 | 709 |
| Major | 73 | - | 20 | 28 | 121 |
| Fatal | 4 | - | - | 5 | 9 |
| Total | 11,066 | 145 | 497 | 519 | 12,227 |

| | |
|---|---|
| DRIVERS WHOSE SEAT BELT USAGE WAS RECORDED | 12,227 |
| TOTAL DRIVERS WEARING PELVIC AND/OR SHOULDER BELTS | 11,211 |
| RECORDED DRIVER BELT USAGE | 91.7% |

**THE REPORTED SEAT BELT USAGE RATE FOR DRIVERS INVOLVED IN COLLISIONS WAS 92%**

Exhibit 2-3

## MOTORCYCLE DRIVER INJURIES

Helmet in Use

| Injury | Yes | | | No | Not Known | Total |
|---|---|---|---|---|---|---|
| None | 27 | (79.4) | (a) | 7 | 1 | 35 |
| Minimal | 61 | (80.3) | | 15 | - | 76 |
| Minor | 80 | (75.5) | | 26 | 2 | 108 |
| Major | 24 | (72.7) | | 9 | 1 | 34 |
| Fatal | 4 | (100.0) | | - | - | 4 |
| Unknown | - | ( - ) | | - | 5 | 5 |
| Totals | 196 | (77.5) | | 57 | 9 | 262 |

**87% OF MOTORCYCLE DRIVERS INVOLVED IN COLLISIONS FOR WHICH INJURY STATUS WAS RECORDED RECEIVED INJURIES. THE LIKELIHOOD OF INJURY WAS SIMILAR FOR HELMET USERS AND NON USERS (HELMETS OFFER PROTECTION ONLY FOR HEAD AND NECK INJURIES).**

**23% OF MOTORCYCLISTS INVOLVED IN COLLISIONS WERE RECORDED AS NOT WEARING SAFETY HELMETS.**

(a) Numbers in brackets are percentages of row totals. Percentages exclude unknown helmet use.

Exhibit 2-4 **PROPERTY DAMAGE ESTIMATES (a)**

| | Total | Average per Collision |
|---|---|---|
| Damage to Vehicles | $13,944,800. | $1,936. |
| Damage to Other Property | 499,500. | 69. |
| All Damage | 14,494,300. | 2,005. |

**THE AVERAGE DAMAGE FOR EACH REPORTED COLLISION WAS $2,005.**

Exhibit 2-5 **ESTIMATED DAMAGE TO MOTOR VEHICLES (a)**

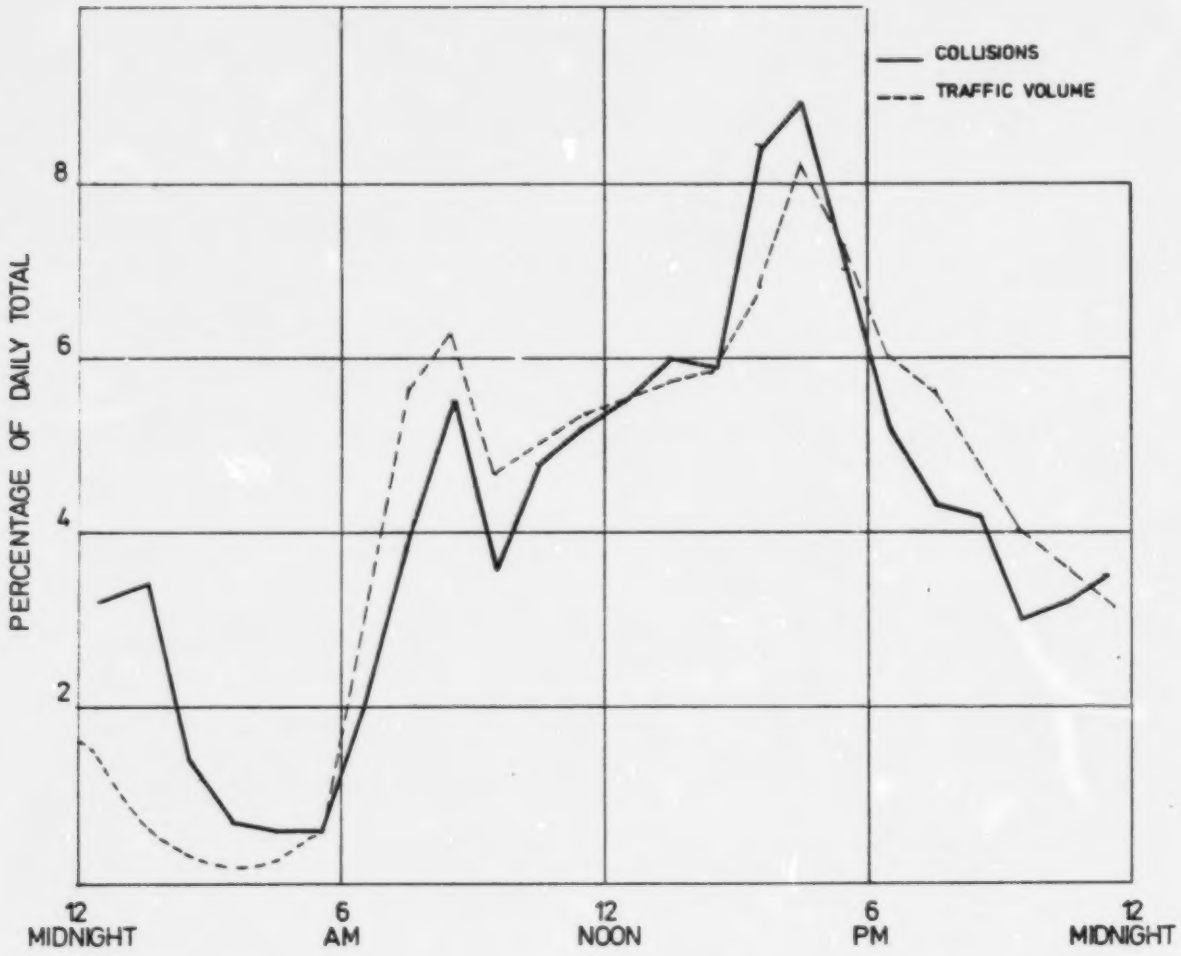
| Damage | No. of Vehicles | % Of All Vehicles Involved |
|---|---|---|
| None | 618 | 8.6 |
| $0 - 199 | 624 | 8.6 |
| $200 - 399 | 784 | 10.8 |
| $400 - 599 | 1,105 | 15.3 |
| $600 - 999 | 1,271 | 17.6 |
| $1,000 - 1,999 | 1,464 | 20.3 |
| $2,000 - 3,999 | 1,054 | 14.6 |
| $4,000 and over | 308 | 4.2 |
| | 7,228 | 100.0 |

**OVER 56% OF THE VEHICLES INVOLVED IN COLLISIONS EXPERIENCED DAMAGE IN EXCESS OF $600.**

(a) As estimated at the scene of the collision.

Exhibit 2-6

**TIME OF DAY VS COLLISIONS AND TRAFFIC VOLUME**



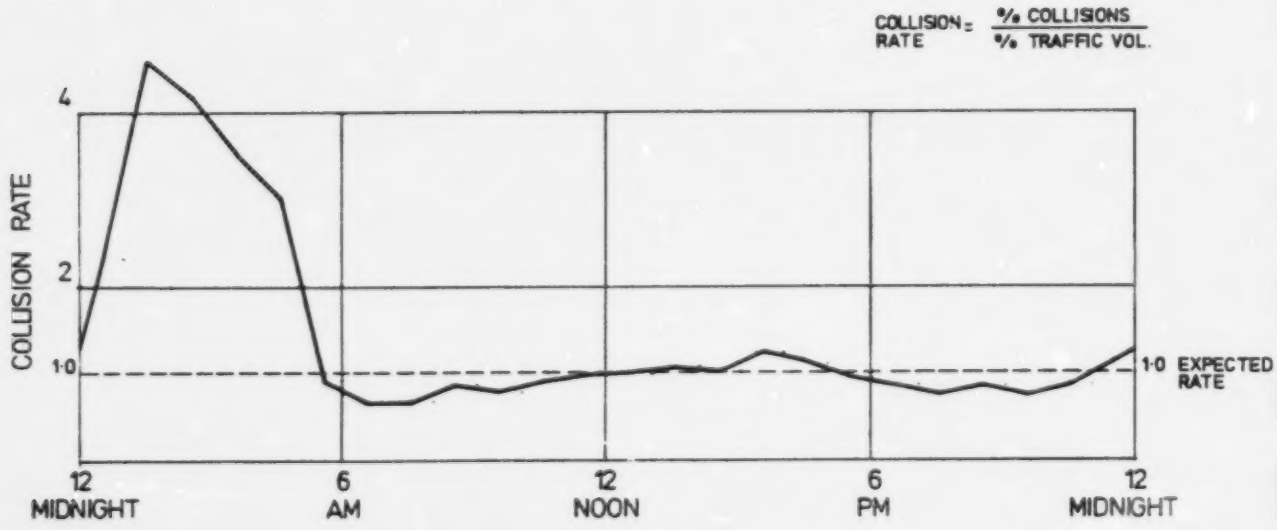



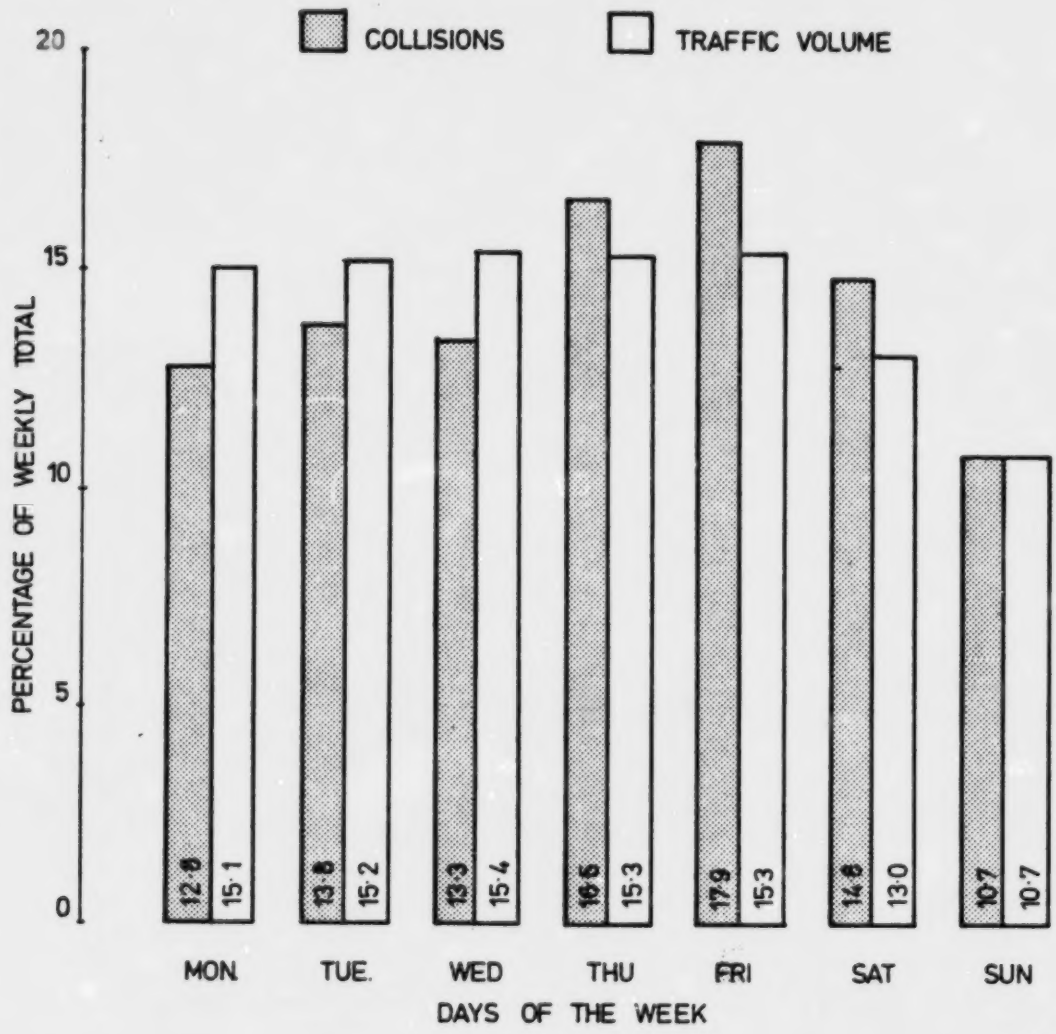
Exhibit 2-7

**COLLISION OCCURRENCES BY TIME OF DAY AND DAY OF WEEK**

| Time | MON | TUES | WED | THUR | FRI | SAT | SUN | TOTALS | (%) |
|---|---|---|---|---|---|---|---|---|---|
| 12 - 1 a.m. | 20 | 24 | 20 | 29 | 25 | 61 | 49 | 228 | ( 3.2) |
| 1 - 2 a.m. | 5 | 17 | 15 | 24 | 27 | 83 | 78 | 249 | ( 3.4) |
| 2 - 3 a.m. | 2 | 10 | 5 | 8 | 15 | 30 | 28 | 98 | ( 1.4) |
| 3 - 4 a.m. | 4 | 6 | 3 | 3 | 5 | 12 | 21 | 54 | ( 0.8) |
| 4 - 5 a.m. | 2 | 4 | 1 | 3 | 8 | 14 | 10 | 42 | ( 0.6) |
| 5 - 6 a.m. | 2 | 7 | 4 | 5 | 4 | 10 | 8 | 40 | ( 0.6) |
| 6 - 7 a.m. | 20 | 28 | 23 | 29 | 26 | 9 | 9 | 144 | ( 2.0) |
| 7 - 8 a.m. | 48 | 54 | 43 | 55 | 48 | 15 | 15 | 278 | ( 3.9) |
| 8 - 9 a.m. | 65 | 81 | 60 | 87 | 68 | 21 | 14 | 396 | ( 5.5) |
| 9 - 10 a.m. | 37 | 38 | 44 | 46 | 47 | 31 | 19 | 262 | ( 3.6) |
| 10 - 11 a.m. | 47 | 40 | 49 | 45 | 65 | 71 | 27 | 344 | ( 4.8) |
| 11 - 12 noon | 57 | 62 | 56 | 60 | 56 | 54 | 32 | 377 | ( 5.2) |
| 12 - 1 p.m. | 48 | 72 | 55 | 75 | 56 | 56 | 38 | 400 | ( 5.5) |
| 1 - 2 p.m. | 62 | 53 | 54 | 82 | 75 | 63 | 43 | 432 | ( 6.0) |
| 2 - 3 p.m. | 51 | 52 | 55 | 65 | 83 | 78 | 45 | 429 | ( 5.9) |
| 3 - 4 p.m. | 87 | 100 | 94 | 101 | 106 | 67 | 54 | 609 | ( 8.4) |
| 4 - 5 p.m. | 93 | 99 | 86 | 122 | 122 | 76 | 48 | 646 | ( 8.9) |
| 5 - 6 p.m. | 69 | 65 | 72 | 92 | 97 | 63 | 47 | 505 | ( 7.0) |
| 6 - 7 p.m. | 43 | 45 | 58 | 60 | 73 | 62 | 37 | 378 | ( 5.2) |
| 7 - 8 p.m. | 46 | 39 | 58 | 51 | 60 | 35 | 25 | 314 | ( 4.3) |
| 8 - 9 p.m. | 34 | 28 | 23 | 52 | 67 | 56 | 46 | 306 | ( 4.2) |
| 9 - 10 p.m. | 22 | 27 | 29 | 32 | 54 | 26 | 25 | 215 | ( 3.0) |
| 10 - 11 p.m. | 34 | 17 | 28 | 31 | 60 | 34 | 26 | 230 | ( 3.2) |
| 11 - 12 a.m. | 30 | 30 | 27 | 45 | 49 | 43 | 28 | 252 | ( 3.5) |
| Totals | 928 | 998 | 962 | 1,202 | 1,296 | 1,070 | 772 | 7,228 | (100.0) |
| % | (12.8) | (13.8) | (13.3) | (16.6) | (17.9) | (14.8) | (10.7) | | |

**THE HIGHEST ONE HOUR COLLISION PERIOD WAS THURSDAY AND FRIDAY BETWEEN 4 P.M. AND 5 P.M.**

## DAY OF WEEK VS COLLISIONS AND TRAFFIC VOLUME




**THE HIGHEST COLLISION RATE (a) OCCURRED ON FRIDAYS**

**(a) RATE = $\frac{\%\ \text{COLLISIONS}}{\%\ \text{VOLUME}}$**

Exhibit 2-9

## MONTH OF YEAR OF OCCURRENCE OF COLLISIONS

| Month | Number of Collisions | Percentage of Total Collisions |
|---|---|---|
| January | 627 | 8.7 |
| February | 499 | 6.9 |
| March | 641 | 8.9 |
| April | 472 | 6.5 |
| May | 568 | 7.9 |
| June | 610 | 8.4 |
| July | 529 | 7.3 |
| August | 599 | 8.3 |
| September | 655 | 9.1 |
| October | 610 | 8.4 |
| November | 721 | 10.0 |
| December | 697 | 9.6 |
| | 7,228 | 100.0 |

**THE HIGHEST NUMBER OF COLLISIONS OCCURRED IN THE MONTH OF NOVEMBER.**

Exhibit 2-10

## INITIAL IMPACT TYPE VS CLASSIFICATION

| Initial Impact Type | Classification A Fatal Injury No. | % | B Non-Fatal Injury No. | % | C Property Damage Only No. | % | D All Collisions No. | % | Column A + B / Column D |
|---|---|---|---|---|---|---|---|---|---|
| Rear End | - | ( - ) | 790 | (29.0) | 845 | (18.8) | 1,635 | (22.6) | 0.48 |
| Angle | 6 | (33.3) | 778 | (28.5) | 1,522 | (33.9) | 2,306 | (31.9) | 0.34 |
| Turning | - | ( - ) | 265 | ( 9.7) | 737 | (16.4) | 1,002 | (13.9) | 0.26 |
| Sideswipe | - | ( - ) | 124 | ( 4.5) | 683 | (15.2) | 807 | (11.2) | 0.15 |
| Approaching | 2 | (11.1) | 106 | ( 3.9) | 137 | ( 3.1) | 245 | ( 3.4) | 0.44 |
| Single Motor Vehicle | 10 | (55.6) | 657 | (24.1) | 557 | (12.4) | 1,224 | (16.9) | 0.55 |
| Other | - | ( - ) | 6 | ( 0.2) | 3 | ( 0.1) | 9 | ( 0.1) | 0.67 |
| | 18 | (100.0) | 2,726 | (100.0) | 4,484 | (100.0) | 7,228 | | |

**55% OF THE INITIAL IMPACTS RECORDED WERE "ANGLE" AND "REAR END".**

**THE PROBABILITY OF FATALITY OR OF INJURY WAS HIGHEST IN REAR END OR SINGLE VEHICLE COLLISIONS**

Exhibit 2-11

## INITIAL IMPACT TYPE VERSUS ROAD LOCATION

| | Road Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Impact Type | Non-Intersection | Intersection Related | In Intersection | At Private Drive | At Railroad | Underpass or Tunnel | Overpass or Bridge | Other | Totals |
| Rear End | 752 | 545 | 209 | 115 | 7 | 2 | 5 | - | 1,635 |
| Angle | 476 | 281 | 1,181 | 359 | 6 | - | 2 | 1 | 2,306 |
| Turning | 132 | 162 | 549 | 157 | - | 1 | 1 | - | 1,002 |
| Sideswipe | 505 | 132 | 101 | 60 | - | 2 | 7 | - | 807 |
| Approaching | 136 | 31 | 57 | 16 | - | 2 | 2 | 1 | 245 |
| Single Motor Vehicle | 753 | 198 | 179 | 67 | 6 | 8 | 13 | - | 1,224 |
| Other | 6 | - | - | 3 | - | - | - | - | 9 |
| TOTALS | 2,760 | 1,349 | 2,276 | 777 | 19 | 15 | 30 | 2 | 7,228 |
| % | (38.2) | (18.7) | (31.5) | (10.7) | (0.3) | (0.2) | (0.4) | ( - ) | (100.0) |

**50% OF COLLISIONS WERE IN, OR ASSOCIATED WITH INTERSECTIONS**

Exhibit 2-12

## INITIAL IMPACT TYPE VERSUS TYPE OF TRAFFIC CONTROL

| Impact Type | Type of Traffic Control: Operating Traffic Signal | Operating Stop Sign | Operating Yield Sign | Police Control | School Guard | School Bus | No Control | Other | Totals |
|---|---|---|---|---|---|---|---|---|---|
| Rear End | 499 | 175 | 26 | 1 | 2 | 6 | 921 | 5 | 1,635 |
| Angle | 625 | 786 | 22 | - | - | 2 | 863 | 8 | 2,306 |
| Turning | 381 | 238 | 4 | - | - | - | 379 | - | 1,002 |
| Sideswipe | 147 | 121 | 3 | - | - | - | 533 | 3 | 807 |
| Approaching | 42 | 48 | 2 | - | - | - | 153 | - | 245 |
| Single Motor Vehicle | 197 | 168 | 5 | - | 5 | 3 | 840 | 6 | 1,224 |
| Other | 1 | 1 | - | - | - | - | 7 | - | 9 |
| TOTALS | 1,892 | 1,537 | 62 | 1 | 7 | 11 | 3,696 | 22 | 7,228 |
| % | (26.2) | (21.3) | (0.9) | (0.0) | (0.1) | (0.2) | (51.0) | (0.3) | (100.0) |

**GREATER THAN ONE-HALF OF ALL COLLISIONS (51%) OCCURRED AT LOCATIONS WITH NO TRAFFIC CONTROL.**

# Chapter Three
# Drivers

**Driver Age**

Although sixteen to nineteen year olds make up only 7 percent of the licenced driving population, this age group was involved in 9.1 percent of reported collisions (Exhibit 3-1).

Drivers under 22 involved in collisions were less likely to have been driving properly at the time of the collision (Exhibit 3-2). Younger drivers involved in collisions were more likely to have committed improper driving actions resulting from poor judgement or lack of maturity. Frequent improper driver actions for this age group were "improper turn", "loss of control of the vehicle", "failure to yield the right-of-way" and "following too close". Drivers over 65 years of age involved in collisions were more likely to have committed infractions involving non-compliance with traffic regulations such as "failure to yield the right-of-way" or "improper turn".

**Drinking Drivers**

Drinking drivers were involved in 10.1 percent of all reported collisions, 27.8 percent of fatal collisions and 12.6 percent of injury collisions (Exhibit 3-3). There was a 30 percent greater chance of an injury occurring in a collision which involved a driver who had been drinking than in a collision in which all drivers were sober. Drivers reported as impaired had relatively constant probability of involvement in injury-causing or property damage only collisions.

Exhibit 3-4 indicates that 36 percent of the collisions which occurred during the period from 10 p.m. to 3 a.m. from Wednesdays to Sundays involved drinking drivers.

Exhibit 3-5 indicates that less than 15 percent of the drivers involved in collisions who had been drinking or were impaired were driving properly at the time of the collision and the most frequently indicated improper driver action was loss of control of the vehicle.

Eighteen, nineteen, twenty and twenty-one year old age groups had above average likelihood of being under the influence of alcohol at the time of a collision (Exhibit 3-6).

**Hit and Run Collisions**

In 1984 there were 825 hit and run collisions involving 826 hit and run drivers, of which 42 percent were subsequently apprehended (Exhibit 3-7). The hit and run collision is more likely to be of a "property damage" classification (Exhibit 3-8).

**Non-Licenced Drivers**

It was determined that the non-licenced driver, including those whose licence was under suspension, was more likely to be involved in a fatal or injury collision (Exhibit 3-9) and also more likely to be under the influence of alcohol at the time of the collision (Exhibit 3-10). The non-licenced driver was also more likely to have been driving too fast for roadway conditions at the time of the collision (Exhibit 3-11).

Exhibit 3-12 indicates that 57 percent of the collisions involving a non-licenced driver occurred between 6 p.m. and 6 a.m. whereas only 33 percent of all collisions occurred during this period. The exhibit also indicates that 78 percent of the alcohol-related collisions occurred during this period. The 6 p.m. to 6 a.m. period is characterized by high alcohol involvement, high involvement of non-licenced drivers and high collision involvement rate.

**Moving Violations**

The Regional Police Department issued over 55,000 moving violation summonses in 1984 and this effort at reducing traffic collisions by selective enforcement is recognized. However, it was determined that, in many cases, enforcement was directed at violations that do not relate proportionately to violations indicated in traffic collisions. This could indicate that the enforcement effort is very successful in that it eliminates collisions of related types. However, this may be an indication that a portion of the enforcement effort is directed at moving violations that are readily enforceable (Exhibit 3-13). It is recognized that some violations involved in collisions are difficult to enforce or represent an unfeasible countermeasure to collision occurrences. For example, "following too close" was indicated in 17.2 percent of the improper driving actions and "failure to yield the right-of-way" was indicated in 23.7 percent of improper driving actions. The former is difficult to enforce in the absence of a collision, and it is unfeasible to enforce the latter. Selective enforcement nonetheless is a recognized collision countermeasure technique for other types of moving violations.

**Motorcycles**

The proportion of motorcycle drivers involved in collisions driving properly in most age groups is higher than the proportion for other motor vehicle drivers for the same age groups (Exhibit 3-14). This exhibit also indicates that the most frequent improper driver action for motorcyclists was "lost control".

**Motorcycles (Cont'd)**

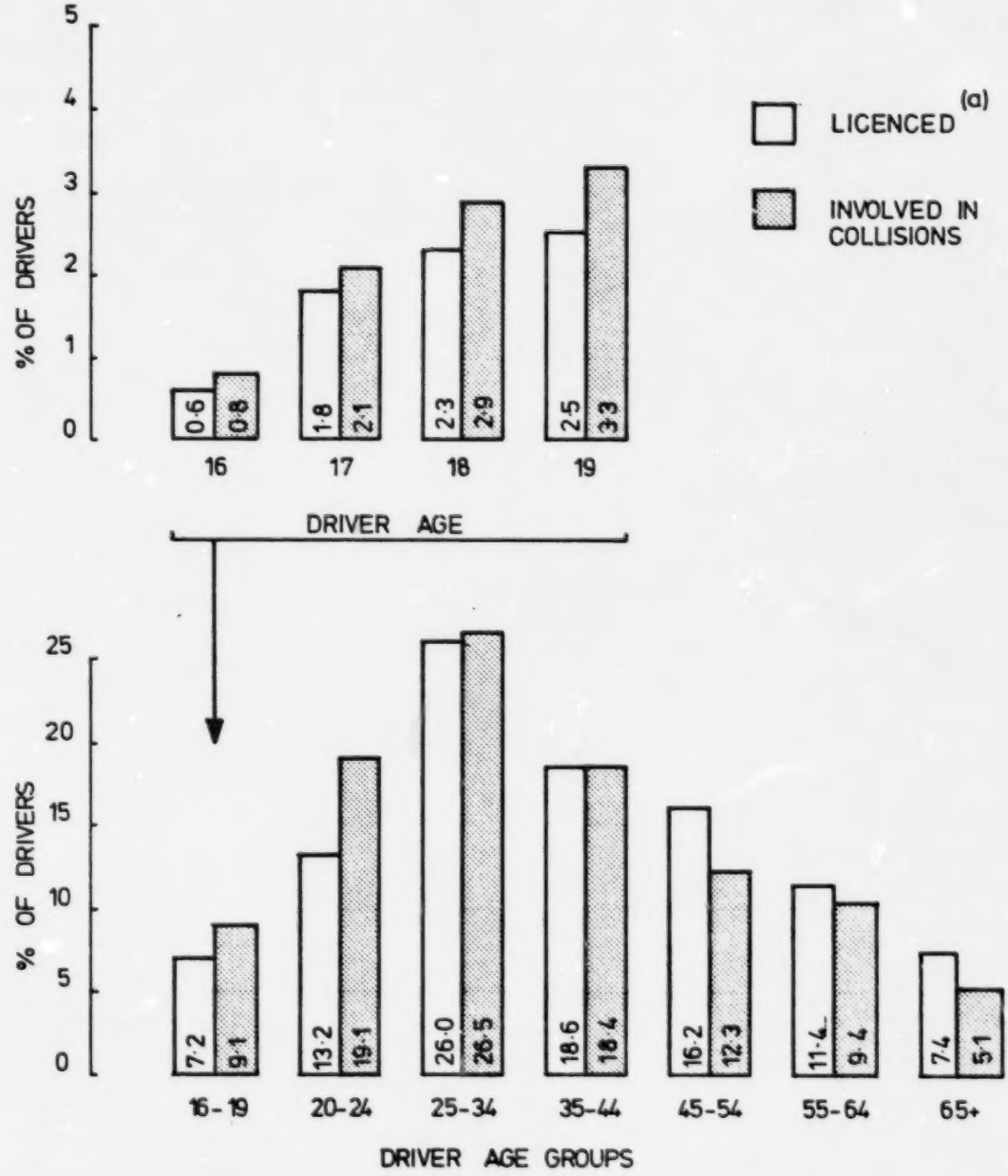
Without more refined data on exposure of motorcyclists in traffic under non-collision circumstances, the significance of a higher proportion of involved motorcycle drivers driving properly in a collision cannot be specifically determined. It could be hypothesized that a motorcycle operator is particularly prone to being involved in a collision when driving properly or alternatively, that the motorcycle operator is particularly adept in avoiding a collision for which he or she would have been responsible.

**Bicycles**

It was determined that responsibility for a collision involving a bicyclist decreased with increased bicyclist age and that 30 percent or less of bicyclists under 15 involved in collisions were recorded as driving properly (Exhibit 3-15). The most predominant known cyclist improper action indicated was "failure to yield the right-of-way" but instances of disobeying other traffic laws were also prominent.

Exhibit 3-1

**LICENCED MOTOR VEHICLE DRIVER AGE VS COLLISION INVOLVEMENT**




**16 TO 24 YEAR OLD DRIVERS WERE INVOLVED IN MORE COLLISIONS PER LICENCED DRIVER THAN ANY OTHER AGE GROUP.**

(a) Licenced in the Province of Ontario.

Exhibit 3-2

## MOTOR VEHICLE DRIVER AGE VS DRIVER ACTION

| Driver Action | 0-4 | 5-9 | 10-14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Driving Properly | 2 | - | - | - | 30 | 76 | 114 | 165 | 206 | 207 | 180 |
| Following Too Close | 1 | - | - | - | 17 | 21 | 41 | 48 | 50 | 61 | 41 |
| Speed Too Fast | - | - | - | - | 5 | 11 | 12 | 18 | 8 | 16 | 14 |
| Improper Turn | 1 | - | - | - | 14 | 19 | 27 | 18 | 26 | 32 | 13 |
| Disobey Traffic Signal | 1 | - | - | - | 1 | 7 | 14 | 3 | 10 | 9 | 13 |
| Disobey Stop Sign | - | - | - | - | - | 5 | 14 | 10 | 13 | 5 | 5 |
| Fail to Yield R.O.W. | 1 | - | - | 1 | 13 | 25 | 38 | 47 | 44 | 43 | 38 |
| Improper Passing | 2 | - | - | - | - | 2 | 2 | 4 | 3 | 2 | 7 |
| Lost Control | - | - | 1 | 2 | 16 | 37 | 45 | 40 | 47 | 44 | 46 |
| Wrong Way One-Way Street | 1 | - | - | - | - | - | - | 1 | - | - | - |
| Not Known | - | - | 1 | 2 | 5 | 18 | 19 | 12 | 30 | 17 | 30 |
| Other Disobey | - | - | - | 1 | 8 | 25 | 27 | 41 | 36 | 49 | 34 |
| Other Control | - | - | - | - | - | 1 | 1 | - | 2 | - | 2 |
| Totals | 9 | - | 2 | 7 | 109 | 247 | 354 | 407 | 475 | 485 | 423 |
| % Drivers involved driving properly(a) | 22.2 | - | - | - | 31.3 | 37.3 | 37.0 | 46.6 | 50.3 | 49.4 | 50.1 |

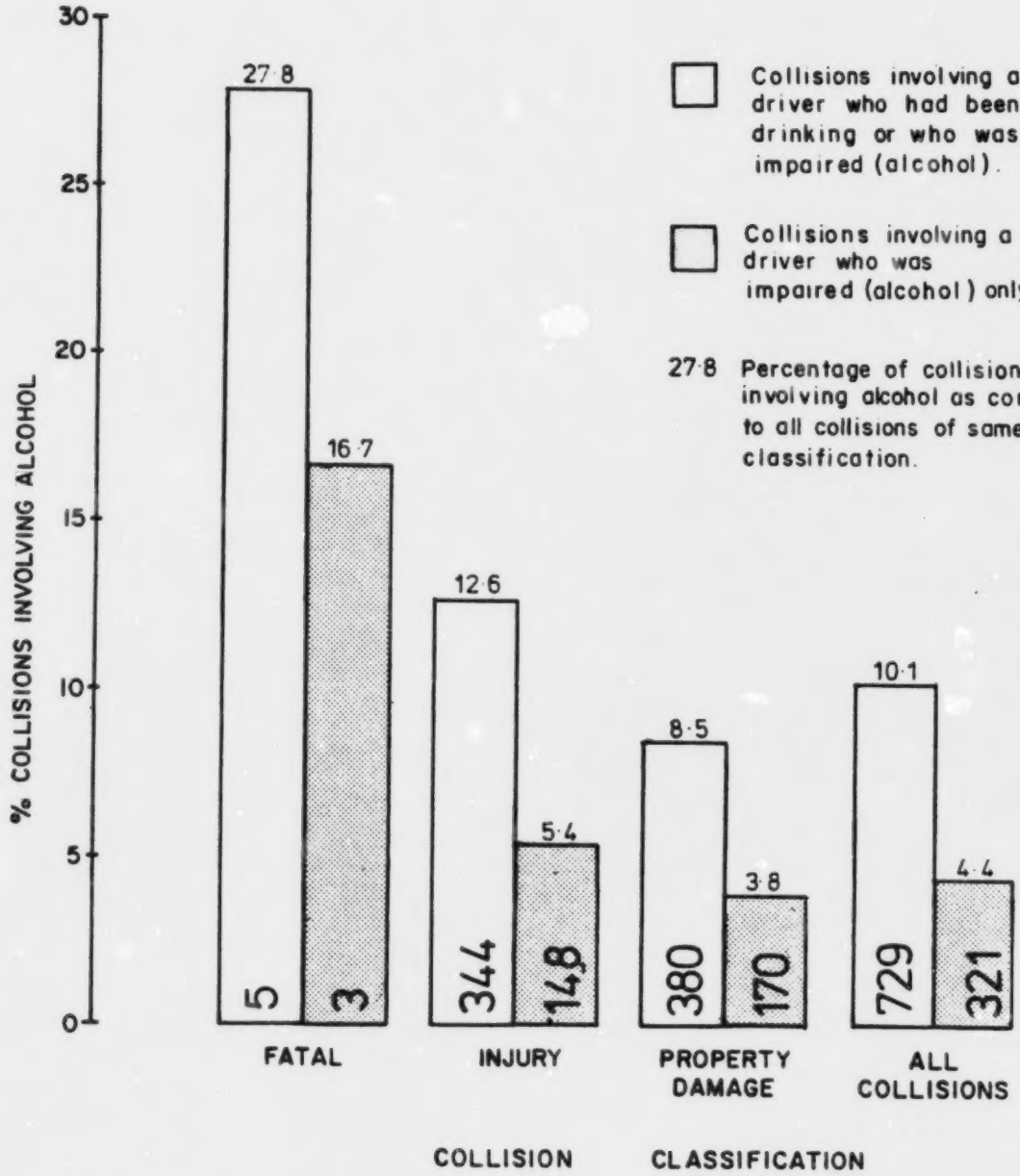
(a) Excluding "Not Known" and "Other".

| 23 | 24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75 + | Totals | % | Driver Action |
|---|---|---|---|---|---|---|---|---|---|---|
| 245 | 237 | 1,706 | 1,203 | 783 | 550 | 180 | 43 | 5,927 | ( 48.6) | Driving Properly |
| 46 | 37 | 254 | 170 | 94 | 63 | 19 | 11 | 974 | ( 8.0) | Following Too Close |
| 14 | 14 | 56 | 28 | 18 | 8 | - | 1 | 223 | ( 1.8) | Speed Too Fast |
| 21 | 18 | 149 | 122 | 100 | 95 | 47 | 14 | 717 | ( 5.9) | Improper Turn |
| 14 | 11 | 78 | 48 | 44 | 42 | 15 | 4 | 314 | ( 2.6) | Disobey Traffic Signal |
| 6 | 6 | 53 | 32 | 22 | 19 | 10 | 7 | 207 | ( 1.7) | Disobey Stop Sign |
| 51 | 47 | 280 | 236 | 175 | 164 | 105 | 34 | 1,342 | ( 11.0) | Fail to Yield R.O.W. |
| 1 | 5 | 27 | 13 | 16 | 10 | 6 | 1 | 101 | ( 0.8) | Improper Passing |
| 40 | 32 | 193 | 109 | 70 | 51 | 20 | 11 | 804 | ( 6.6) | Lost Control |
| 2 | 1 | 7 | 3 | 2 | 1 | - | 1 | 19 | ( 0.2) | Wrong Way One-Way Street |
| 20 | 19 | 175 | 116 | 69 | 52 | 16 | 10 | 611 | ( 5.0) | Not Known |
| 30 | 24 | 241 | 158 | 96 | 86 | 44 | 14 | 914 | ( 7.5) | Other |
| - | 1 | 9 | 11 | 6 | 4 | 6 | 2 | 45 | ( 0.4) | Disobey Other Control |
| 490 | 452 | 3,228 | 2,249 | 1,495 | 1,145 | 468 | 153 | 12,198 | (100.0) | Totals |
| 55.7 | 57.9 | 60.7 | 60.9 | 58.9 | 54.6 | 44.1 | 33.3 | 55.5 | | % Drivers involved driving properly (a) |

**THE OVERALL PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS 55.5%. THE PERCENTAGE OF DRIVERS DRIVING PROPERLY FOR DRIVER AGE GROUPS UNDER 20 AND OVER 64 WAS LESS THAN 50%.**

**THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTION WAS FAILING TO YIELD RIGHT-OF-WAY.**

## ALCOHOL INVOLVEMENT VS COLLISION CLASSIFICATION




**COLLISIONS IN WHICH AN INJURY OR FATALITY OCCURRED WERE MORE LIKELY TO INVOLVE A DRIVER WHO HAD BEEN DRINKING THAN PROPERTY DAMAGE ONLY COLLISIONS.**

**IMPAIRED DRIVERS HAD RELATIVELY HIGHER INVOLVEMENT IN FATAL COLLISIONS.**

Exhibit 3-4

## TIME OF DAY AND DAY OF WEEK OF COLLISIONS INVOLVING ALCOHOL

| Time of Day | MON | TUES | WED | THUR | FRI | SAT | SUN | TOTAL |
|---|---|---|---|---|---|---|---|---|
| 12 - 1 a.m. | 2 | 3 | 4 | 8 | 9 | 22 | 17 | 65 |
| 1 - 2 a.m. | 1 | 6 | 7 | 11 | 14 | 47 | 35 | 121 |
| 2 - 3 a.m. | 2 | 4 | - | 3 | 5 | 16 | 13 | 43 |
| 3 - 4 a.m. | 1 | 3 | 1 | - | 4 | 3 | 8 | 20 |
| 4 - 5 a.m. | - | 1 | - | - | 4 | 2 | 3 | 10 |
| 5 - 6 a.m. | - | 1 | 1 | - | 2 | 4 | 1 | 9 |
| 6 - 7 a.m. | - | 1 | 1 | - | - | 1 | 2 | 5 |
| 7 - 8 a.m. | - | - | 1 | 1 | - | 3 | 3 | 8 |
| 8 - 9 a.m. | - | - | - | - | - | 2 | 1 | 3 |
| 9 - 10 a.m. | - | - | 4 | - | - | - | 3 | 7 |
| 10 - 11 a.m. | 1 | - | 1 | - | - | 2 | - | 4 |
| 11 - 12 noon | - | 1 | 1 | 2 | - | 2 | - | 6 |
| 12 - 1 p.m. | 2 | 1 | - | 1 | 1 | 2 | - | 7 |
| 1 - 2 p.m. | 2 | - | 1 | 2 | 2 | 3 | 1 | 11 |
| 2 - 3 p.m. | 2 | - | 1 | 2 | 1 | 2 | 3 | 11 |
| 3 - 4 p.m. | 6 | 2 | 2 | 3 | 2 | 5 | 6 | 26 |
| 4 - 5 p.m. | 2 | 4 | 5 | 1 | 3 | 10 | 5 | 30 |
| 5 - 6 p.m. | 5 | 3 | 5 | 3 | 10 | 10 | 8 | 44 |
| 6 - 7 p.m. | 6 | 3 | 4 | 5 | 6 | 10 | 3 | 37 |
| 7 - 8 p.m. | 1 | 5 | 4 | 4 | 8 | 9 | 2 | 33 |
| 8 - 9 p.m. | 7 | 8 | 5 | 9 | 9 | 12 | 8 | 58 |
| 9 - 10 p.m. | 5 | 5 | 7 | 6 | 16 | 9 | 3 | 51 |
| 10 - 11 p.m. | 5 | 3 | 6 | 14 | 11 | 9 | 11 | 59 |
| 11 - 12 midnight | 1 | 7 | 5 | 11 | 17 | 11 | 9 | 61 |
| Totals | 51 | 61 | 66 | 86 | 124 | 196 | 145 | 729 |

**36% OF THE COLLISIONS WHICH OCCURRED DURING THE PERIOD FROM 10:00 P.M. TO 3:00 A.M., WEDNESDAYS TO SUNDAYS INVOLVED ALCOHOL.**

**11% OF ALL ALCOHOL RELATED COLLISIONS OCCURRED BETWEEN 1:00 A.M. AND 2:00 A.M. ON SATURDAYS AND SUNDAYS.**

**10.1% OF ALL COLLISIONS INVOLVED ONE OR MORE DRIVERS WHO HAD BEEN DRINKING.**

Exhibit 3-5

## DRIVER ACTION VS DRIVER CONDITION

| | Normal | Had Been Drinking | Impaired-Alcohol | Impaired-Drugs | Fatigue |
|---|---|---|---|---|---|
| Driving Properly | 5,818 | 58 | 6 | - | - |
| Following Too Close | 894 | 32 | 19 | - | - |
| Speed Too Fast | 144 | 40 | 31 | - | 1 |
| Improper Turn | 664 | 19 | 12 | 1 | - |
| Disobey Traffic Signal | 286 | 13 | 9 | - | - |
| Disobey Stop Sign | 185 | 6 | 7 | 1 | - |
| Fail to Yield Right-of-Way | 1,267 | 30 | 16 | - | 1 |
| Improper Passing | 88 | 4 | 6 | - | - |
| Lost Control | 503 | 128 | 95 | 2 | 6 |
| Wrong Way on One-Way Street | 14 | 1 | 4 | - | - |
| Not Known | 351 | 26 | 29 | - | - |
| Other | 711 | 60 | 84 | 2 | 10 |
| Disobey Other Control | 37 | 3 | 3 | 1 | - |
| Totals | 10,962 | 420 | 321 | 7 | 18 |
| % Drivers involved driving properly(a) | 58.8 | 17.4 | 2.9 | - | - |

(a) Excluding not known and other.

| Medical Defect | Not Known | Other | Totals | (%) | |
|---|---|---|---|---|---|
| 2 | 43 | - | 5,927 | ( 48.6) | Driving Properly |
| 3 | 26 | - | 974 | ( 8.0) | Following Too Close |
| - | 7 | - | 223 | ( 1.8) | Speed Too Fast |
| - | 20 | 1 | 717 | ( 5.9) | Improper Turn |
| - | 6 | - | 314 | ( 2.6) | Disobey Traffic Signal |
| - | 8 | - | 207 | ( 1.7) | Disobey Stop Sign |
| 1 | 27 | - | 1,342 | ( 11.0) | Fail to Yield Right-of-Way |
| - | 3 | - | 101 | ( 0.8) | Improper Passing |
| 11 | 58 | 1 | 804 | ( 6.6) | Lost Control |
| - | - | - | 19 | ( 0.2) | Wrong Way on One-Way Street |
| 2 | 203 | - | 611 | ( 5.0) | Not Known |
| 6 | 40 | 1 | 914 | ( 7.5) | Other |
| - | 1 | - | 45 | ( 0.4) | Disobey Other Control |
| 25 | 442 | 3 | 12,198 | (100.0) | Totals |
| 11.8 | 21.6 | - | 55.5 | | % Drivers involved driving properly[a] |

**LESS THAN 15% OF DRIVERS WHO HAD BEEN DRINKING OR WERE IMPAIRED WERE RECORDED AS DRIVING PROPERLY AT THE TIME OF THE COLLISION.**

Exhibit 3-6

## MOTOR VEHICLE DRIVER AGE VS DRIVER CONDITION

| Driver Condition | 0 - 4 | 5 - 9 | 10- 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| Normal | 8 | - | 2 | 2 | 99 | 223 | 310 | 363 | 411 | 422 |
| Had Been Drinking | - | - | - | - | 2 | 10 | 21 | 22 | 29 | 22 |
| Impaired - Alcohol | 1 | - | - | - | 2 | 4 | 4 | 7 | 10 | 20 |
| Impaired - Drugs | - | - | - | - | - | - | - | 1 | 1 | - |
| Fatigue | - | - | - | - | - | - | 2 | - | 2 | 1 |
| Medical Defect | - | - | - | - | 1 | - | - | - | - | 1 |
| Not Known | - | - | - | 5 | 5 | 10 | 17 | 14 | 21 | 19 |
| Other | - | - | - | - | - | - | - | - | 1 | - |
| Totals | 9 | - | 2 | 7 | 109 | 247 | 354 | 407 | 475 | 485 |
| % Drinking Drivers Involved(a) | - | - | - | - | 3.9 | 5.9 | 7.4 | 7.4 | 8.6 | 9.0 |

(a) Excluding not known and other.

| 22-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75 + | Total | % | Driver Condition |
|---|---|---|---|---|---|---|---|---|---|
| 1,190 | 2,883 | 2,035 | 1,379 | 1,058 | 438 | 139 | 10,962 | 89.8 | Normal |
| 68 | 112 | 63 | 40 | 21 | 6 | 4 | 420 | 3.4 | Had Been Drinking |
| 50 | 96 | 64 | 30 | 24 | 7 | 2 | 321 | 2.6 | Impaired-Alcohol |
| - | 3 | 1 | 1 | - | - | - | 7 | 0.1 | Impaired-Drugs |
| 2 | 5 | 2 | 2 | 2 | - | - | 18 | 0.2 | Fatigue |
| 1 | 6 | 5 | - | 8 | 1 | 2 | 25 | 0.2 | Medical Defect |
| 53 | 123 | 78 | 43 | 32 | 16 | 6 | 442 | 3.6 | Not Known |
| 1 | - | 1 | - | - | - | - | 3 | 0.0 | Other |
| 1,365 | 3,228 | 2,249 | 1,495 | 1,145 | 468 | 153 | 12,198 | 100.0 | Totals |
| | | | | | | | | | % Drinking Drivers Involved[(a)] |
| 9.0 | 6.7 | 5.9 | 4.8 | 4.0 | 2.9 | 4.1 | 6.3 | | |

**6.3% OF ALL DRIVERS INVOLVED HAD BEEN DRINKING OR WERE IMPAIRED BY ALCOHOL AT THE TIME OF THE COLLISION.**

**THE 18, 19, 20 AND 21 YEAR OLD AGE GROUPS HAD ABOVE AVERAGE LIKELIHOODS OF BEING UNDER THE INFLUENCE OF ALCOHOL AT THE TIME OF A COLLISION.**

Exhibit 3-7

## HIT AND RUN COLLISIONS

| | | |
|---|---|---|
| HIT AND RUN COLLISIONS | 825 | |
| HIT AND RUN DRIVERS (a) | 826 | |
| DRIVERS APPREHENDED | 347 | (42%) |

**42% OF HIT AND RUN DRIVERS WERE SUBSEQUENTLY APPREHENDED.**

Exhibit 3-8

## HIT AND RUN COLLISION CLASSIFICATION

| COLLISIONS IN WHICH: | FATAL | INJURY | PROPERTY DAMAGE | TOTAL |
|---|---|---|---|---|
| Driver(s) Apprehended | 1 | 97 | 249 | 347 |
| Driver(s) Not Apprehended | - | 81 | 397 | 478 |
| TOTAL | 1 (0%) | 178 (21.6%) | 646 (78.3%) | 825 (100%) |

**78.3% OF HIT AND RUN COLLISIONS INVOLVED PROPERTY DAMAGE ONLY.**

(a) One collision involved two hit and run drivers.

Exhibit 3-9

**LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS CLASSIFICATION OF COLLISION**

| Classification | Non-Licenced No. | (% of Non-Licenced) | Licenced No. | (% of Licenced) |
|---|---|---|---|---|
| Fatal | 2 | ( 1.2) | 24 | ( 0.2) |
| Injury | 65 | ( 40.1) | 4,606 | ( 38.3) |
| Property Damage | 95 | ( 58.7) | 7,406 | ( 61.5) |
| Total | 162 | (100.0) | 12,036 | (100.0) |

**A HIGHER PROBABILITY OF A FATAL OR INJURY COLLISION IS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.**

Exhibit 3-10

**LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS DRIVER CONDITION**

| Driver Condition | Non-Licenced No. | (% of Non-Licenced) | Licenced No. | (% of Licenced) |
|---|---|---|---|---|
| Normal | 81 | ( 50.0) | 10,882 | ( 90.4) |
| Had Been Drinking | 27 | ( 16.7) | 393 | ( 3.3) |
| Impaired - Alcohol | 27 | ( 16.7) | 294 | ( 2.4) |
| Impaired - Drugs | 1 | ( 0.6) | 6 | ( 0.1) |
| Fatigue | - | ( 0.0) | 18 | ( 0.2) |
| Medical Defect | 1 | ( 0.6) | 24 | ( 0.2) |
| Not Known | 25 | ( 15.4) | 417 | ( 3.5) |
| Other | - | ( 0.0) | 3 | ( 0.0) |
| Total | 162 | (100.0) | 12,037 | (100.0) |

**A HIGHER PROBABILITY OF ALCOHOL USE WAS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.**

**AN UNLICENCED DRIVER INVOLVED IN A COLLISION WAS OVER FIVE TIMES AS LIKELY TO HAVE BEEN UNDER THE INFLUENCE OF ALCOHOL OR DRUGS AS A LICENCED DRIVER.**

Exhibit 3-11

**LICENCE STATUS OF MOTOR VEHICLE DRIVER VS DRIVER ACTION**

| Driver Action | Non-Licenced No. | (% of Non-Licenced) | Licenced No. | (% of Licenced) |
|---|---|---|---|---|
| Driving Properly | 28 | ( 17.3) | 5,899 | ( 49.0) |
| Following Too Close | 8 | ( 4.9) | 966 | ( 8.0) |
| Speed Too Fast | 7 | ( 4.3) | 216 | ( 1.8) |
| Improper Turn | 7 | ( 4.3) | 710 | ( 5.9) |
| Disobey Traffic Signal | 4 | ( 2.5) | 310 | ( 2.6) |
| Disobey Stop Sign | 5 | ( 3.1) | 202 | ( 1.7) |
| Fail to Yield R.O.W. | 7 | ( 4.3) | 1,335 | ( 11.1) |
| Improper Passing | 3 | ( 1.9) | 98 | ( 0.8) |
| Lost Control | 44 | ( 27.2) | 759 | ( 6.3) |
| Wrong Way on One Way Street | 1 | ( 0.6) | 18 | ( 0.2) |
| Not Known | 21 | ( 13.0) | 590 | ( 4.9) |
| Other | 26 | ( 16.1) | 888 | ( 7.4) |
| Disobey Other Control | 1 | ( 0.6) | 44 | ( 0.4) |
| Total | 162 | (100.0) | 12,035 | (100.0) |
| % Drivers Driving Properly (a) | | ( 24.4) | | ( 55.9) |

**24% OF INVOLVED NON-LICENCED DRIVERS WERE DRIVING PROPERLY COMPARED WITH 56% OF LICENCED DRIVERS.**

**THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTIONS FOR NON-LICENCED DRIVERS WERE "LOST CONTROL" AND "FOLLOWING TOO CLOSE".**

(a) Excluding "Not Known" and "Other".

Exhibit 3-12

**TIME OF DAY VERSUS COLLISIONS FOR TOTAL COLLISIONS, COLLISIONS INVOLVING NON-LICENCED DRIVERS AND COLLISIONS INVOLVING ALCOHOL.**

| Time of Day | Collisions Involving Non-Licenced Drivers No. | (%) | % of Collisions Involving Alcohol | % of Total Collisions Occurring |
|---|---|---|---|---|
| 12 - 1 a.m. | 8 | 4.9 | 8.9 | 3.2 |
| 1 - 2 a.m. | 8 | 4.9 | 16.6 | 3.4 |
| 2 - 3 a.m. | 6 | 3.7 | 5.9 | 1.4 |
| 3 - 4 a.m. | 6 | 3.7 | 2.7 | 0.8 |
| 4 - 5 a.m. | 3 | 1.8 | 1.4 | 0.6 |
| 5 - 6 a.m. | 1 | 0.6 | 1.2 | 0.6 |
| 6 - 7 a.m. | 2 | 1.2 | 0.7 | 2.0 |
| 7 - 8 a.m. | 5 | 3.0 | 1.1 | 3.9 |
| 8 - 9 a.m. | 7 | 4.3 | 0.4 | 5.5 |
| 9 - 10 a.m. | 1 | 0.6 | 1.0 | 3.6 |
| 10 - 11 a.m. | 6 | 3.7 | 0.5 | 4.8 |
| 11 - 12 noon | 4 | 2.4 | 0.8 | 5.2 |
| 12 - 1 p.m. | 7 | 4.3 | 1.0 | 5.5 |
| 1 - 2 p.m.5 | 5 | 3.0 | 1.5 | 6.0 |
| 2 - 3 p.m. | 7 | 4.3 | 1.5 | 5.9 |
| 3 - 4 p.m. | 9 | 5.5 | 3.6 | 8.4 |
| 4 - 5 p.m. | 14 | 8.5 | 4.1 | 8.9 |
| 5 - 6 p.m. | 4 | 2.4 | 6.0 | 7.0 |
| 6 - 7 p.m. | 12 | 7.3 | 5.1 | 5.2 |
| 7 - 8 p.m. | 8 | 4.9 | 4.5 | 4.3 |
| 8 - 9 p.m. | 11 | 6.7 | 8.0 | 4.2 |
| 9 - 10 p.m. | 8 | 4.9 | 7.0 | 3.0 |
| 10 - 11 p.m. | 13 | 7.9 | 8.1 | 3.2 |
| 11 - 12 midnight | 9 | 5.5 | 8.4 | 3.5 |
| Totals | 164 | 100.0 | 100.0 | 100.0 |

**BETWEEN 7 P.M. AND 4 A.M., THERE WAS A HIGHER PROPORTION OF NON-LICENCED DRIVERS INVOLVED IN COLLISIONS.**
**ALCOHOL INVOLVEMENT IN COLLISIONS FOLLOWED A SIMILAR PATTERN.**

Exhibit 3-13

## IMPROPER DRIVER ACTIONS VS ENFORCEMENT

| Apparent Improper Driver Action | Column A<br>% of Improper Driver Actions In Collisions | Column B<br>% of All Comparable Charges Laid in 1984 by Hamilton-Wentworth Police | Column B / Column A |
|---|---|---|---|
| Follow too close | 17.2 | 1.8 | 0.1 |
| Speed too fast | 3.9 | 55.6 | 14.3 |
| Improper turn | 12.7 | 17.8 | 1.4 |
| Disobey traffic signal | 5.5 | 8.2 | 1.5 |
| Disobey stop or yield sign | 3.7 | 5.7 | 1.5 |
| Fail to yield right-of-way | 23.7 | 1.8 | 0.1 |
| Improper passing | 1.8 | 0.3 | 0.2 |
| Lost Control | 14.2 | - | - |
| Wrong way on one-way street | 0.3 | 1.8 | 6.0 |
| Disobey other control | 0.8 | 0.1 | 0.1 |
| Other | 16.1 | 6.9 | 0.4 |
| | 100.0 | 100.0 | |

**41% OF IMPROPER DRIVER ACTIONS ASSOCIATED WITH COLLISIONS ARE DRIVER ACTIONS WHICH CANNOT BE READILY ENFORCED, SUCH AS FOLLOWING TOO CLOSELY, OR FAILING TO YIELD THE RIGHT OF WAY.**

**A PREDOMINANT NUMBER OF CHARGES WERE LAID UNDER LAWS WHICH ARE READILY ENFORCED.**

Exhibit 3-14

## MOTORCYCLE DRIVER AGE VS DRIVER ACTION

| Driver Action | 0 - 14 | 15 - 19 | 20 - 24 | 25 - 34 | 35 - 44 | 45 + | Total | (%) |
|---|---|---|---|---|---|---|---|---|
| Driving Properly | - | 32 | 50 | 44 | 12 | 6 | 144 | ( 56.0) |
| Following Too Close | - | 7 | 6 | 3 | 1 | - | 17 | ( 6.6) |
| Speed Too Fast | - | 6 | 5 | 4 | - | - | 15 | ( 5.8) |
| Improper Turn | - | 1 | - | 1 | - | - | 2 | ( 0.8) |
| Disobey Traffic Signal | - | 1 | - | - | 1 | - | 2 | ( 0.8) |
| Disobey Stop Sign | - | 3 | 4 | - | - | - | 7 | ( 2.7) |
| Fail to Yield R.O.W. | - | 2 | 2 | 2 | - | - | 6 | ( 2.3) |
| Improper Passing | - | 2 | 2 | - | - | - | 4 | ( 1.6) |
| Lost Control | - | 10 | 11 | 6 | 3 | 1 | 31 | ( 12.1) |
| Wrong Way One-Way Street | - | - | - | - | - | - | - | ( 0.0) |
| Not Known | 1 | 2 | 5 | 3 | 1 | 2 | 14 | ( 5.4) |
| Other Disobey | - | 3 | 5 | 5 | - | - | 13 | ( 5.1) |
| Other Control | - | 1 | 1 | - | - | - | 2 | ( 0.8) |
| Totals | 1 | 70 | 91 | 68 | 18 | 9 | 257 | (100.0) |
| % Involved Motorcycle Drivers Driving Properly[a] | - | 49.2 | 61.7 | 73.3 | 70.6 | 85.7 | 62.6 | |
| % Involved Drivers Driving Properly for all Vehicle Types[a] | - | 39.9 | 52.8 | 60.7 | 60.9 | 54.1 | 55.5 | |

**MOTORCYCLE DRIVERS WERE MORE LIKELY TO BE DRIVING PROPERLY THAN MOTOR VEHICLE OPERATORS.**

**THE MOST FREQUENT IMPROPER MOTORCYCLE DRIVER ACTION WAS "LOST CONTROL".**

(a) Excluding "not known" and "other".

Exhibit 3-15

## CYCLIST ACTION VS AGE OF CYCLIST

| Apparent Cyclist Action | 0 - 4 | 5 - 9 | 10 - 14 | 15 - 19 | 20 - 24 |
|---|---|---|---|---|---|
| Driving Properly | - | 4 | 9 | 28 | 11 |
| Following Too Close | - | - | - | 1 | 1 |
| Speed Too Fast | - | 3 | 2 | 3 | - |
| Improper Turn | - | - | 4 | 1 | 1 |
| Disobey Traffic Signal | - | 2 | 2 | - | 3 |
| Disobey Stop Sign | - | 3 | 1 | 1 | - |
| Fail to Yield Right-of-Way | 2 | 9 | 10 | 3 | 5 |
| Improper Passing | - | - | - | 2 | - |
| Lost Control | - | 2 | 1 | 3 | - |
| Wrong Way on One-Way Road | - | 1 | - | - | 1 |
| Not Known | - | - | 2 | 6 | - |
| Other | - | 4 | 4 | 8 | - |
| Disobey Other Control | - | - | 1 | - | - |
| Totals | 2 | 28 | 36 | 56 | 22 |
| % Involved Cyclists Driving Properly (a) | - | 16.7 | 30.0 | 66.7 | 50.0 |

(a) Excluding "Not Known" and "Other".

| 25 - 34 | 35 - 44 | 45 - 54 | 55 + | Totals | (%) | Apparent Cyclist Action |
|---|---|---|---|---|---|---|
| 17 | 2 | 3 | 1 | 75 | ( 42.1) | Driving Properly |
| - | - | - | - | 2 | ( 1.1) | Following Too Close |
| - | - | - | - | 8 | ( 4.5) | Speed Too Fast |
| - | - | 1 | - | 7 | ( 3.9) | Improper Turn |
| - | - | - | - | 7 | ( 3.9) | Disobey Traffic Signal |
| 2 | - | - | - | 7 | ( 3.9) | Disobey Stop Sign |
| 1 | - | 1 | - | 31 | ( 17.4) | Fail to Yield Right-of-Way |
| - | - | - | - | 2 | ( 1.1) | Improper Passing |
| - | - | - | - | 6 | ( 3.4) | Lost Control |
| - | - | - | - | 2 | ( 1.1) | Wrong Way on One-Way Road |
| 1 | - | 1 | 2 | 12 | ( 6.8) | Not Known |
| 1 | 1 | - | - | 18 | ( 10.1) | Other |
| - | - | - | - | 1 | ( 0.6) | Disobey Other Control |
| 22 | 3 | 6 | 3 | 178 | (100.0) | Totals |
| 85.0 | 100.0 | 60.0 | 100.0 | 50.7 | | % Involved Cyclists Driving Properly |

**CYCLISTS UNDER 15 WERE MOST LIKELY TO BE DRIVING IN A MANNER THAT VIOLATED BASIC RULES OF THE ROAD.**

# Chapter Four
# Pedestrians

## General

In 1984, there were 320 pedestrian collisions resulting in 314 pedestrian injuries, and 6 fatalities. For 2 collisions, full information was not available, so this chapter bases statistics on 318 collisions.

## Age

The relationship between the Regional population distribution and pedestrian involvement in collisions in 1984 was reviewed (Exhibit 4-1). It was determined that 5 to 9 year old pedestrians had a rate of collision involvement approximately 2.2 times that expected when compared on the basis of the age distribution of the Regional population.

The variations in rate might be explained by certain pedestrian age groups crossing streets more frequently than others (i.e. exposure). It is, however, unlikely that the 5 to 9 year old group would have different exposure to traffic than the 10 to 14 year old group, and, therefore, the 5 to 9 year old pedestrian would appear to be considerably more prone to collision involvement.

## Pedestrian Action

Exhibit 4-2 indicates the pedestrian action at the time of the collision versus pedestrian age. In general, the instances of unsafe pedestrian action for pedestrians involved in collisions were greater for pedestrians under 10 years of age.

This exhibit also indicates that the actions of "coming from behind a parked car" or "unexpectedly running into the roadway" accounted for 31.7 percent of the pedestrian actions at the time of the collisions. These unsafe actions are particularly associated with pedestrians under 10 years of age.

Pedestrians under 14 years of age and between 65 and 74 years of age were more likely to be involved in collisions as a result of not crossing with the right of way at traffic signals (Exhibit 4-3).

## Time of Collision

An analysis was performed on the time of day of collisions compared to pedestrian age (Exhibit 4-4) and it was determined that 27.4 percent of pedestrians were injured in collisions which occurred between 3 p.m. and 6 p.m. Forty-three children between 5 and 14 years of age were involved in pedestrian collisions which occurred at school crossing times.* This represents 14 percent of the 318 pedestrians involved in collisions in 1984 or 46 percent of all involved 5 - 14 year olds. Of the 43 school age children involved, 11 were crossing at traffic signals.

* School crossing times: 8:00 a.m. - 9:15 a.m., 11:30 a.m. - 1:45 p.m., 3:30 p.m. - 4:45 p.m., Monday - Friday; excluding June, July and August.

**Pedestrian Condition**

In most cases, the condition of the pedestrian involved in the collision was reported as normal. However, in approximately 8 percent of the collisions involving pedestrians, the pedestrian condition was recorded as "had been drinking" or "impaired" (Exhibit 4-5).

**Locations**

Exhibit 4-6 indicates the pedestrian age for pedestrians involved in collisions compared with the type of traffic control. In 45.9 percent of the pedestrian collisions, the collision occurred at a mid-block or other location with no control. For pedestrians under 10 years of age, 49 percent were involved at mid-block or other locations with no control. This is to be expected, as the majority of collisions that involved a young pedestrian resulted from the pedestrian entering the roadway unexpectedly.

**Driver Action**

Exhibit 4-7 indicates that in approximately 63 percent of the motor vehicle-pedestrian collisions, the driver was recorded as driving properly. This figure does not necessarily suggest that the drivers involved in these collisions were totally without blame but does indicate that a majority of pedestrian collisions are associated with improper pedestrian action or lack of awareness of traffic conditions at the time of the collision.

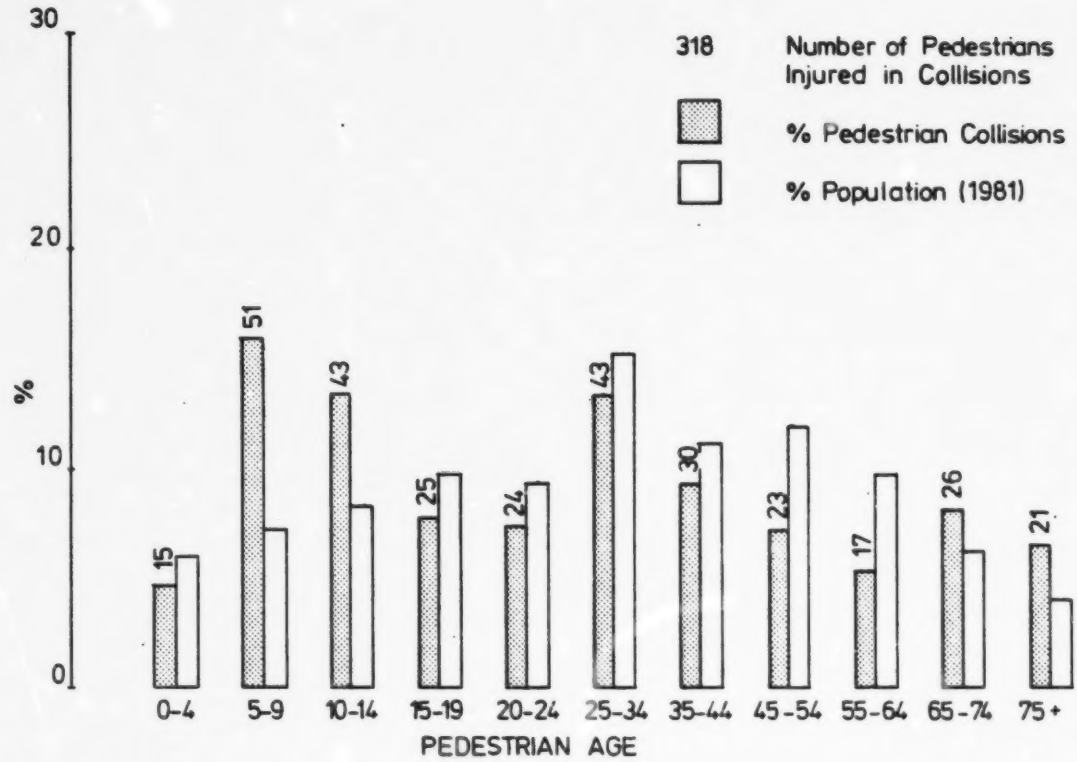
Of the 37 percent of motor vehicle-pedestrian collisions in which the driver was not driving properly, the most frequently recorded driver action was failing to yield the right-of-way (associated with 13 percent of all motor vehicle-pedestrian collisions).

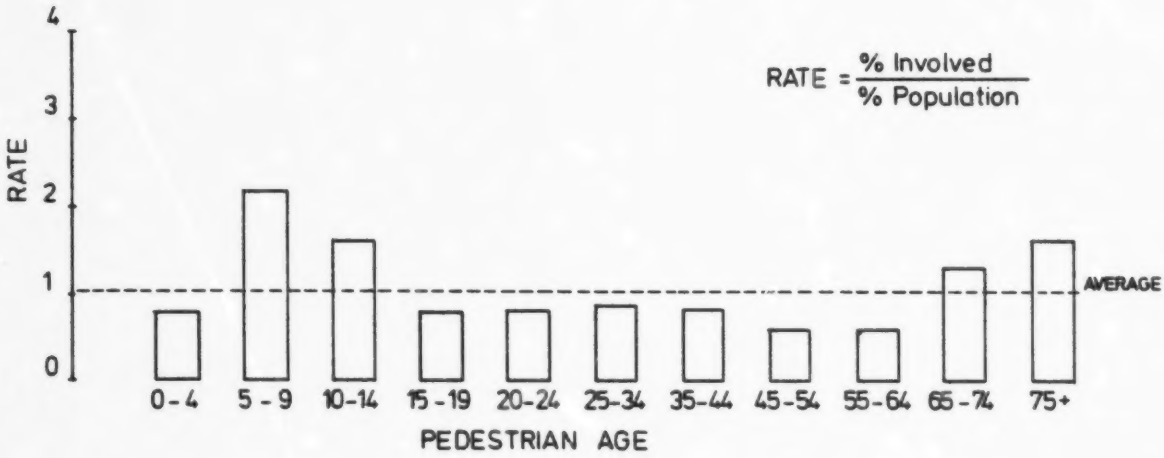
**Pedestrian Injuries**

Most pedestrians (approximately 84%) suffered only minor injuries when involved in a collision. Exhibit 4-8 indicates that pedestrians under 5 or over 54 years of age were more likely to suffer serious injury. This figure may be as a result of crossing behaviour or may simply reflect the average persons' ability to recover from injury or partially avoid the collision.

Exhibit 4-1

**PEDESTRIAN AGE VS POPULATION**




**5 TO 9 YEAR OLD PEDESTRIANS WERE INVOLVED IN COLLISIONS AT A RATE TWO TIMES THE AVERAGE.**

Exhibit 4-2

## PEDESTRIAN AGE VS ACTION

| Pedestrian Action | 0 - 4 | 5 - 9 | 10 - 14 | 15 - 19 | 20 - 24 | 25 - 34 |
|---|---|---|---|---|---|---|
| Crossing intersection with right-of-way | 2 | 6 | 4 | 3 | 6 | 13 |
| Crossing intersection without right-of-way * | - | 1 | 8 | 3 | 6 | 3 |
| Crossing intersection - no control | - | - | - | - | - | 1 |
| Walk with traffic * | - | - | - | - | 1 | - |
| Walk against traffic | - | - | - | - | 1 | 1 |
| On sidewalk or shoulder | - | 2 | 2 | 3 | 2 | 4 |
| Play/work on highway * | - | 2 | 1 | 1 | 1 | 1 |
| Come from behind parked car * | 7 | 7 | 4 | - | 1 | 2 |
| Run into roadway * | 4 | 30 | 15 | 5 | 3 | 9 |
| Cross through traffic * | - | 2 | 7 | 5 | 3 | 5 |
| Other | 1 | 1 | 2 | 5 | - | 4 |
| Totals | 14 | 51 | 43 | 25 | 24 | 43 |
| % Involved Pedestrians with Unsafe Action (Excluding "other") | 73.3 | 82.4 | 81.4 | 56.0 | 62.5 | 46.5 |

* Actions considered unsafe

| 35 - 44 | 45 - 54 | 55 - 64 | 65 - 74 | 75 + | Total | (%) | Pedestrian Action |
|---|---|---|---|---|---|---|---|
| 9 | 8 | 4 | 8 | 3 | 66 | ( 20.8) | Crossing intersection with right-of-way |
| 2 | 2 | 4 | 7 | 4 | 40 | ( 12.6) | Crossing intersection without right-of-way * |
| - | - | - | 1 | 3 | 5 | ( 1.6) | Crossing intersection - no control |
| 1 | - | - | - | - | 2 | ( 0.6) | Walk with traffic * |
| - | - | - | 1 | - | 3 | ( 1.0) | Walk against traffic |
| 6 | 2 | - | 1 | 2 | 24 | ( 7.6) | On sidewalk or shoulder |
| 1 | 2 | - | - | - | 9 | ( 2.8) | Play/work on highway * |
| 1 | - | 1 | - | 1 | 24 | ( 7.6) | Come from behind parked car * |
| 4 | 2 | 3 | 2 | - | 77 | ( 24.3) | Run into roadway * |
| 6 | 5 | 3 | 4 | 5 | 45 | ( 14.2) | Cross through traffic * |
| - | 2 | 2 | 2 | 3 | 22 | ( 6.9) | Other |
| 30 | 23 | 17 | 26 | 21 | 317 | (100.0) | Totals |
| 50.0 | 47.8 | 64.7 | 50.0 | 47.6 | 61.9 | | % Involved Pedestrians with Unsafe Action (Excluding "other") |

**THE INSTANCES OF UNSAFE PEDESTRIAN ACTIONS WERE HIGHEST FOR AGE GROUPS UNDER 15.**

**32% OF PEDESTRIANS INVOLVED IN COLLISIONS ENTERED THE ROADWAY UNEXPECTEDLY (CAME FROM BEHIND PARKED CARS OR RAN INTO THE ROADWAY).**

Exhibit 4-3

**PEDESTRIAN AGE VS ACTION AT TRAFFIC SIGNALS**

| Pedestrian Action | 0 - 4 Years | 5 - 9 Years | 10 - 14 Years | 15 - 19 Years | 20 - 24 Years | 25 - 34 Years |
|---|---|---|---|---|---|---|
| Crossing Intersection with Right-of-Way | 1 | 5 | 3 | 2 | 3 | 6 |
| Crossing Intersection without Right-of-Way * | - | 1 | 6 | 3 | 4 | 3 |
| Walking on Roadway Against Traffic | - | - | - | - | 1 | - |
| On Sidewalk or Shoulder | - | - | - | - | - | - |
| Coming From Behind Parked Vehicle or Object* | 1 | - | - | - | - | - |
| Run Into Roadway * | - | 3 | 5 | 2 | - | 4 |
| Cross Through Traffic * | - | - | - | 1 | - | 1 |
| Other | - | - | - | - | - | 1 |
| Total | 2 | 9 | 14 | 8 | 8 | 15 |
| % Pedestrians Crossing or Walking with Right-of-Way (a) | 50.0 | 55.6 | 21.4 | 25.0 | 37.5 | 46.2 |

NOTES: (a) Not including "Other"
* Actions considered unsafe

| 35 - 44 Years | 45 - 54 Years | 55 - 64 Years | 65 - 74 Years | 75 + Years | Row Total | % | Pedestrian Action |
|---|---|---|---|---|---|---|---|
| 6 | 8 | 2 | 5 | 1 | 42 | ( 39.3) | Crossing Intersection with Right-of-Way |
| 2 | 2 | 4 | 6 | 1 | 32 | ( 29.9) | Crossing Intersection without Right-of-Way |
| - | - | - | - | - | 1 | ( 0.9) | Walking on Roadway Against Traffic |
| - | 2 | - | 1 | - | 3 | ( 2.8) | On Sidewalk or Shoulder |
| - | - | 1 | - | - | 2 | ( 1.9) | Coming From Behind Parked Vehicle or Object* |
| 1 | - | 1 | - | - | 16 | ( 15.0) | Run Into Roadway * |
| 1 | 1 | - | 1 | 1 | 6 | ( 5.6) | Cross Through Traffic * |
| - | - | 1 | 1 | 2 | 5 | ( 4.7) | Other |
| 10 | 13 | 9 | 14 | 5 | 107 | (100.0) | Total |
| 66.7 | 61.5 | 25.0 | 38.5 | 33.3 | 41.2 | | % Pedestrians Crossing or Walking with Right-of-Way (a) |

**PEDESTRIANS UNDER THE AGE OF 20 AND OVER 65 YEARS OF AGE WERE MUCH MORE LIKELY TO BE INVOLVED IN A COLLISION WHILE CROSSING WITHOUT THE RIGHT-OF-WAY.**

Exhibit 4-4

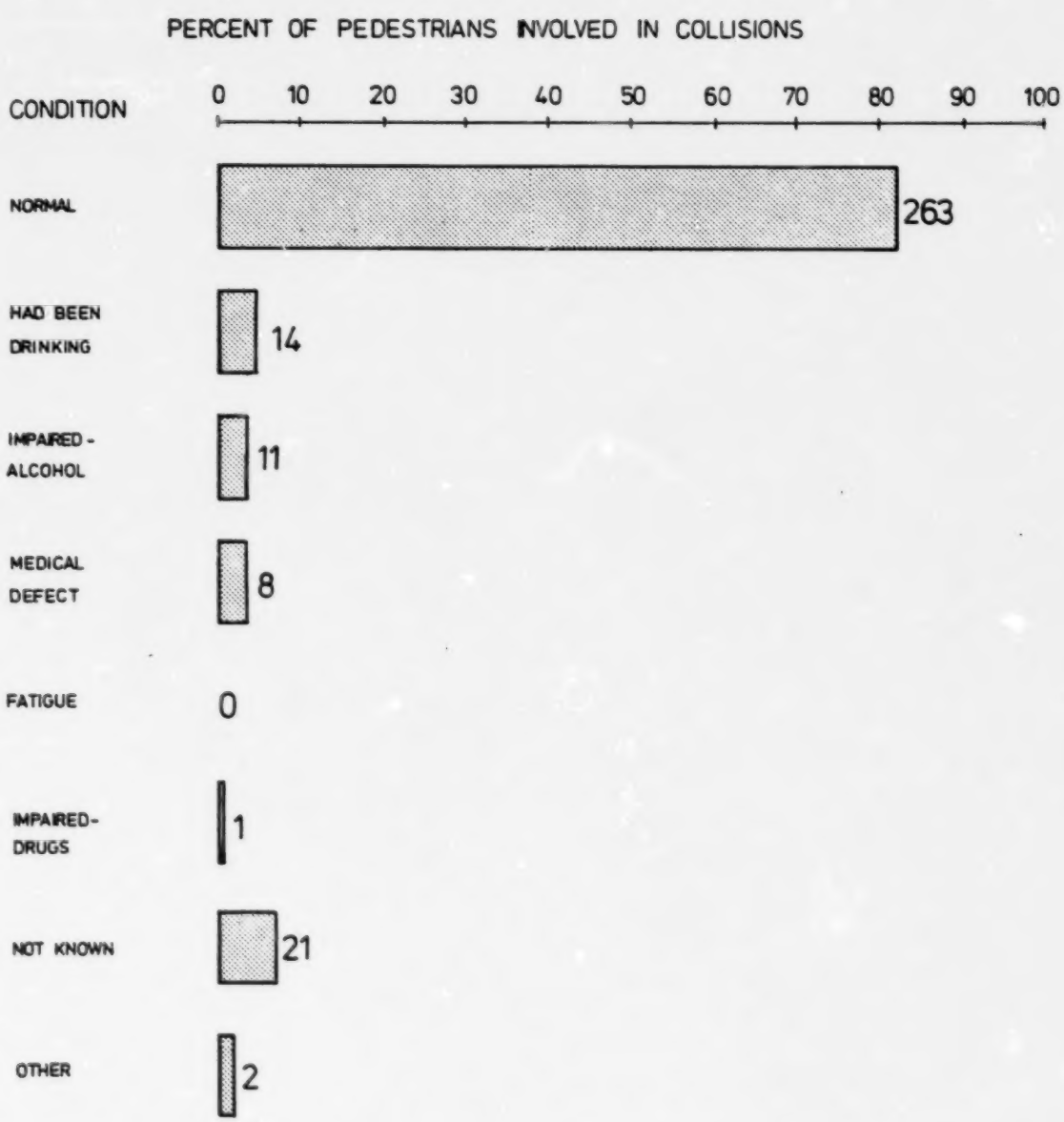
## TIME OF DAY VS PEDESTRIAN AGE

| Time of Day | 0-4 Yrs | 5-9 Yrs | 10-14 Yrs | 15-19 Yrs | 20-24 Yrs | 25-34 Yrs | 35-44 Yrs | 45-54 Yrs | 55-64 Yrs | 65-74 Yrs | 75 + Yrs | Row Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 - 1 a.m. | - | - | - | - | 1 | 2 | - | - | 1 | - | - | 4 |
| 1 - 2 a.m. | - | - | - | 1 | 2 | 1 | - | - | - | - | - | 4 |
| 2 - 3 a.m. | - | - | - | - | - | 2 | - | - | - | - | - | 2 |
| 3 - 4 a.m. | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 - 5 a.m. | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 - 6 a.m. | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 - 7 a.m. | - | - | 1 | 1 | - | 2 | 2 | 1 | 1 | - | - | 8 |
| 7 - 8 a.m. | - | 1 | 2 | 1 | 1 | 2 | 1 | 1 | - | 1 | 1 | 10 |
| 8 - 9 a.m. | - | 6 | 6 | - | - | 3 | 1 | 3 | - | - | 1 | 20 |
| 9 - 10 a.m. | 1 | - | 1 | - | - | - | 3 | - | 1 | 2 | - | 8 |
| 10 - 11 a.m. | 1 | - | 2 | 1 | 1 | 1 | 1 | - | 1 | 2 | 2 | 12 |
| 11 - 12 noon | 2 | 2 | - | - | - | 3 | - | 1 | 1 | 4 | 6 | 19 |
| 12 - 1 p.m. | 3 | 10 | 3 | - | 2 | 3 | 2 | 3 | - | 3 | - | 29 |
| 1 - 2 p.m. | - | 4 | 4 | 3 | 2 | 3 | 1 | 1 | - | - | 2 | 20 |
| 2 - 3 p.m. | - | 2 | 1 | 1 | 1 | 2 | 1 | 4 | - | - | 1 | 13 |
| 3 - 4 p.m. | 2 | 10 | 6 | 3 | 1 | 2 | 4 | - | 1 | 3 | 1 | 33 |
| 4 - 5 p.m. | 1 | 7 | 6 | 3 | 2 | - | 2 | 2 | 3 | 1 | 2 | 29 |
| 5 - 6 p.m. | 1 | 5 | 5 | 3 | 1 | 3 | 2 | 1 | 3 | 1 | - | 25 |
| 6 - 7 p.m. | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 3 | 1 | 3 | 2 | 21 |
| 7 - 8 p.m. | 2 | 3 | 1 | 2 | - | 2 | - | 2 | - | 1 | 2 | 15 |
| 8 - 9 p.m. | - | 1 | 2 | 2 | 4 | 4 | 1 | - | 1 | 2 | 1 | 18 |
| 9 - 10 p.m. | - | - | - | 2 | - | 3 | 2 | - | 1 | 2 | - | 10 |
| 10 - 11 p.m. | - | - | 1 | 1 | 4 | 1 | 1 | - | 1 | - | - | 9 |
| 11 - 12 a.m. | - | - | - | - | 1 | 1 | 4 | 1 | 1 | 1 | - | 9 |
| Total | 15 | 51 | 43 | 25 | 24 | 43 | 30 | 23 | 17 | 26 | 21 | 318 |

**27.4% OF PEDESTRIANS WERE INJURED IN COLLISIONS WHICH OCCURRED BETWEEN 3 P.M. AND 6 P.M.**

Exhibit 4-5

## PEDESTRIAN CONDITION




**7.8 PERCENT OF THE PEDESTRIANS INVOLVED IN COLLISIONS WERE IMPAIRED BY OR HAD BEEN DRINKING ALCOHOL.**

Exhibit 4-6

## PEDESTRIAN AGE VS TYPE OF TRAFFIC CONTROL

| Type of Control | 0 - 4 | 5 - 9 | 10 - 14 | 15 - 19 | 20 - 24 | 25 - 34 | 35 - 44 |
|---|---|---|---|---|---|---|---|
| Traffic Signal | 2 | 9 | 14 | 8 | 8 | 15 | 10 |
| Stop Sign | - | 10 | 9 | 5 | 6 | 5 | 8 |
| Yield Sign | - | - | - | - | - | - | - |
| School Guard | - | - | - | - | 1 | 2 | - |
| School Bus | 1 | 1 | - | - | - | - | - |
| No Control | 12 | 31 | 20 | 12 | 8 | 21 | 12 |
| Other | - | - | - | - | 1 | - | - |
| Totals | 15 | 51 | 43 | 25 | 24 | 43 | 30 |
| % Pedestrians Involved in Collisions at Midblock or Other Locations With No Control | 80.0 | 60.8 | 46.5 | 48.0 | 37.5 | 48.8 | 40.0 |

| 45 - 54 | 55 - 64 | 65 - 74 | 75 + | Totals | (%) | Type of Control |
|---|---|---|---|---|---|---|
| 13 | 9 | 14 | 5 | 107 | ( 33.7) | Traffic Signal |
| 1 | 4 | 5 | 6 | 59 | ( 18.6) | Stop Sign |
| - | - | - | - | - | ( 0.0) | Yield Sign |
| 1 | - | - | - | 4 | ( 1.3) | School Guard |
| - | - | - | - | 2 | ( 0.6) | School Bus |
| 8 | 4 | 7 | 10 | 145 | ( 45.6) | No Control |
| - | - | - | - | 1 | ( 0.3) | Other |
| 23 | 17 | 26 | 21 | 318 | (100.0) | Totals |
| 34.8 | 23.5 | 26.9 | 47.6 | 45.9 | | % Pedestrians Involved in Collisions at Mid-Block or Other Locations With No Control |

**46% OF PEDESTRIAN COLLISIONS OCCURRED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.**

**FOR PEDESTRIANS UNDER 10 YEARS OF AGE 49% WERE INVOLVED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.**

Exhibit 4-7

## DRIVER ACTION IN PEDESTRIAN COLLISIONS

| Action | In Pedestrian Collisions | % Pedestrian Collisions |
|---|---|---|
| Driving Properly | 198 | 62.5 |
| Following Too Closely | 1 | 0.3 |
| Speed Too Fast | 4 | 1.3 |
| Improper Turn | 3 | 1.0 |
| Disobey Traffic Signal | 5 | 1.6 |
| Disobey Stop Sign | 2 | 0.6 |
| Fail to Yield Right-of-Way | 42 | 13.3 |
| Improper Passing | - | - |
| Wrong Way One-Way Street | - | - |
| Lost Control | 4 | 1.3 |
| Not Known | 33 | 10.4 |
| Other | 18 | 5.7 |
| Disobey Other Control | 7 | 2.2 |
| | 317 (a) | 100.0 |

**63% OF THE MOTOR VEHICLE DRIVERS INVOLVED IN PEDESTRIAN COLLISIONS WERE RECORDED AS DRIVING PROPERLY.**

**THE MOST FREQUENTLY RECORDED IMPROPER DRIVER ACTION WAS FAILURE TO YIELD THE RIGHT-OF-WAY.**

(a) Note - Pedestrian collisions involved more than one driver or vehicle in some cases. Data not available on driver action in several collisions.

Exhibit 4-8

## PEDESTRIAN AGE VERSUS INJURY STATUS

| Pedestrian Age | Status of Inury | | | | | % Major or Fatal Injury |
|---|---|---|---|---|---|---|
| | Minimal | Minor | Major | Fatal | Total | |
| 0 - 4 | 6 | 6 | 2 | 1 | 15 | 20.0 |
| 5 - 9 | 25 | 19 | 7 | - | 51 | 13.7 |
| 10 - 14 | 13 | 26 | 4 | - | 43 | 9.3 |
| 15 - 19 | 10 | 13 | 2 | - | 25 | 8.0 |
| 20 - 24 | 7 | 13 | 4 | - | 24 | 16.7 |
| 25 - 34 | 17 | 17 | 8 | 1 | 43 | 18.6 |
| 35 - 44 | 13 | 14 | 3 | - | 30 | 10.0 |
| 45 - 54 | 6 | 14 | 3 | - | 23 | 13.0 |
| 55 - 64 | 2 | 11 | 4 | - | 17 | 23.5 |
| 65 - 74 | 8 | 10 | 6 | 2 | 26 | 30.8 |
| 75 & Over | 4 | 12 | 3 | 2 | 21 | 23.8 |
| TOTAL | 111 | 155 | 46 | 6 | 318 | 16.4 |
| % | 34.9 | 48.7 | 14.5 | 1.9 | 100.0 | |

EIGHTY-FOUR PERCENT OF PEDESTRIANS INVOLVED IN COLLISIONS SUFFERED ONLY MINIMAL OR MINOR INJURIES.

PEDESTRIANS UNDER 5 YEARS OF AGE OR OVER 54 YEARS OF AGE WERE MOST LIKELY TO SUFFER SERIOUS INJURY IN A COLLISION.

# Chapter Five
# Vehicles

## Vehicle Type

For drivers involved in collisions, the percentage of drivers driving properly was higher than average for drivers of conventional buses (Exhibit 5-1). Caution should be exercised when interpreting this exhibit as there is no indication of vehicle exposure.

## Vehicle Defects

Vehicle defects were recorded for 150 or approximately 1 percent of the vehicles involved in 1984 collisions (Exhibit 5-2). The most frequently recorded defect was a poor or ineffective vehicle braking system. Although a vehicle defect was recorded, it does not necessarily follow that the defect was the proximate cause of the collision.

Exhibit 5-1

## DRIVER ACTION VS VEHICLE TYPE

| Driver Action | Non-motor Vehicle | Passenger Car | Car and Trailer | Truck | Truck and Semi | Truck and Trailer |
|---|---|---|---|---|---|---|
| Driving Properly | 75 | 4,947 | 10 | 674 | 59 | 19 |
| Follow Too Close | 2 | 800 | 2 | 146 | 12 | 2 |
| Speed Too Fast | 8 | 186 | - | 25 | 1 | - |
| Improper Turn | 7 | 598 | - | 91 | 28 | 1 |
| Disobey Traffic Signal | 7 | 274 | - | 36 | 2 | - |
| Disobey Stop Sign | 7 | 176 | - | 28 | 1 | - |
| Fail to Yield R.O.W. | 31 | 1,164 | 1 | 165 | 8 | 1 |
| Improper Passing | 2 | 78 | - | 20 | 1 | - |
| Lost Control | 6 | 708 | - | 99 | 4 | - |
| Wrong Way on One-Way | 2 | 20 | - | - | - | - |
| Not Known | 13 | 817 | - | 123 | 15 | 1 |
| Other | 18 | 660 | 3 | 227 | 21 | 3 |
| Disobey Other Control | 1 | 28 | - | 11 | 3 | - |
| Totals | 179 | 10,456 | 16 | 1,645 | 155 | 27 |
| % Involved Drivers Driving Properly (a) | 50.7 | 55.1 | 76.9 | 52.1 | 49.6 | 79.2 |

**FOR DRIVERS INVOLVED IN COLLISIONS, THE PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS HIGHEST FOR DRIVERS OF CONVENTIONAL-TYPE BUSES.**

(a) Excluding "not known" and "other".

| Motor-Cycle | Bus | School Bus | Other | Totals | (%) | Driver Action |
|---|---|---|---|---|---|---|
| 144 | 118 | 11 | - | 6,057 | ( 46.9) | Driving Properly |
| 17 | 7 | 1 | - | 989 | ( 7.7) | Follow Too Close |
| 15 | 1 | - | - | 236 | ( 1.8) | Speed Too Fast |
| 2 | 3 | 2 | - | 732 | ( 5.7) | Improper Turn |
| 2 | 2 | - | - | 323 | ( 2.5) | Disobey Traffic Signal |
| 7 | 1 | - | - | 220 | ( 1.7) | Disobey Stop Sign |
| 6 | 4 | 2 | 1 | 1,383 | ( 10.7) | Fail to Yield R.O.W. |
| 4 | 2 | 1 | - | 108 | ( 0.8) | Improper Passing |
| 31 | 1 | 1 | - | 850 | ( 6.7) | Lost Control |
| - | - | - | - | 22 | ( 0.2) | Wrong Way on One-Way |
| 16 | 6 | 1 | 1 | 993 | ( 7.7) | Not Known |
| 13 | 9 | 1 | 1 | 956 | ( 7.4) | Other |
| 2 | 2 | - | - | 47 | ( 0.4) | Disobey Other Control |
| 259 | 156 | 20 | 3 | 12,916 | (100.0) | Totals |
| 62.6 | 83.7 | 61.1 | 0.0 | 55.2 | | % Involved Drivers Driving Properly (a) |

Exhibit 5-2

## VEHICLE DEFECTS

| Defect Type | Non Motor Vehicle | Passenger Cars | Car and Trailer | Truck | Truck and Trailer | Truck and Semi | Motor-Cycle | Bus | School Bus | Other | Totals | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brakes | 3 | 24 | - | 8 | - | 3 | 1 | 1 | - | - | 40 | 26.7 |
| Steering | - | 5 | - | 1 | 1 | - | - | - | - | - | 7 | 4.7 |
| Tire Puncture or Blowout | - | 9 | - | 2 | - | - | - | - | - | - | 11 | 7.3 |
| Tire Tread Insufficient | - | 9 | - | - | - | 1 | 2 | - | - | - | 12 | 8.0 |
| Headlamps Defective | 2 | 2 | - | 1 | - | - | - | - | - | - | 5 | 3.3 |
| Other Lamps or Reflectors Defective | - | 5 | - | - | - | 1 | - | - | - | - | 6 | 4.0 |
| Engine Control Defective | - | 6 | - | 1 | - | - | - | - | - | - | 7 | 4.7 |
| Wheels or Suspension Defective | - | 3 | - | 3 | - | - | - | - | 1 | - | 7 | 4.7 |
| Vision Obsured | - | 6 | - | 2 | - | - | 1 | - | - | - | 9 | 6.0 |
| Trailer Hitch Defective | - | - | - | 1 | 4 | 2 | - | - | - | - | 7 | 4.7 |
| Other | 2 | 22 | - | 12 | 2 | 1 | - | - | - | - | 39 | 26.0 |
| Totals | 7 | 91 | - | 31 | 7 | 8 | 4 | 1 | 1 | - | 150 | 100.0 |
| | 3.9 | 0.8 | 0.0 | 1.8 | 25.9 | 5.1 | 1.5 | 0.6 | 5.0 | 0.0 | 1.1% | |

Defective Vehicles as a % of all vehicles of the same type involved in collisions (a)

DEFECTIVE BRAKES ACCOUNTED FOR 26.7% OF THE RECORDED DEFECTS.

(a) Does not include parked vehicles.

# Chapter Six
# Environment

**Light Conditions**

Exhibit 6-1 indicates that most collisions occurred under clear visibility conditions. Although poor light conditions can make driving difficult, collisions under these conditions are probably associated with drivers failing to adjust properly to changed conditions, particularly those associated with the roadway surface. Exhibit 6-2 indicates that 65.8 percent of the collisions occurred under daylight conditions.

**Road Surface**

An estimated 63.8 percent of collisions occurred under dry pavement conditions (Exhibit 6-3).

**Pavement Markings**

In accordance with Exhibit 6-4, an estimated 76.8 percent of collisions occurred on marked roadways where the markings were visible. In over 74 percent of the cases where the road markings were recorded as not visible or obscured, snow, slush, or ice conditions were also reported. It is important to note that pavement markings that are not visible to the driver are not necessarily associated with collision cause. Further analysis would be necessary to indicate whether or not there was a causal relationship.

**Road Character**

Exhibits 6-5 and 6-7 show that of collisions occurring at intersections, 62 percent occurred at the intersection of two, two-way undivided roads and 87 percent occurred at the intersection of two roadways with straight and level alignment.

Exhibits 6-6 and 6-8 show that, for collisions occurring at locations other than intersections, 80 percent occurred on two-way undivided roadways and 73 percent occurred on straight and level alignment.

As normalizing data such as the percentages, various categories of intersections and the traffic volumes passing through those intersections is not presently available, it is not possible to state that one intersection type is less prone to collision occurrence than another. However, the reader is referred to Exhibit 7-4 in regard to signalized intersections and Exhibit 7-7 in regard to arterial roadway sections.

**Road Location and Traffic Control**

Exhibit 6-9 indicates that the greatest number of collisions occurred at non-intersection locations. If the intersection-related and in-intersection categories are combined, there were a greater number of collisions directly or indirectly related to intersections. As the exposure to vehicle conflicts is inherently greater at intersection locations, this result is not unexpected. Exhibit 6-10 indicates that collisions occurring at signalized intersections have approximately the same chance of resulting in serious injury than do collisions occurring at stop- or yield-controlled intersections, or locations with no control.

Exhibit 6-11 indicates that the measured point of impact of almost one-half of all collisions was within 9 metres of the curb lines of an intersection. Twenty-one percent of collisions occurred at signalized intersections, and 10% of collisions occurred at intersections with no formal control.

**Road Condition**

An estimated 99 percent of roads were in good condition at the time of the collision (Exhibit 6-12). Although some roadways were under construction or under repair in the vicinity of the collision, this does not directly imply that road condition was a contributing cause of the collision.

**Fixed Objects**

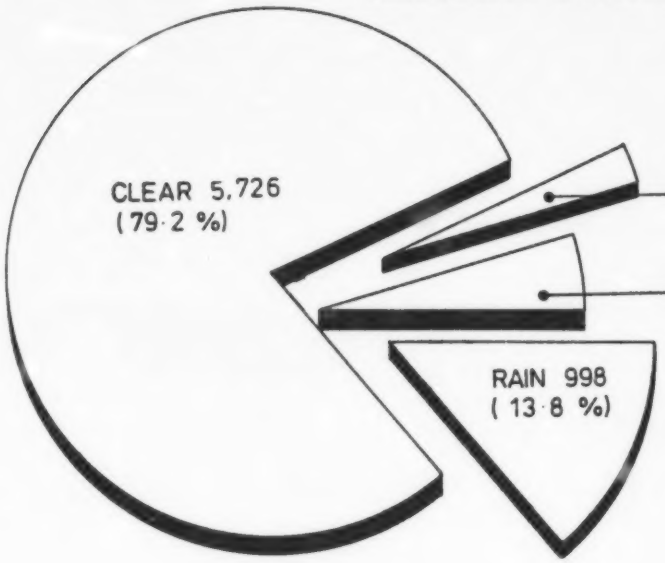
There were 1,121 recorded cases where vehicles struck fixed objects by the roadside (Exhibits 6-13 and 6-14). Twenty-eight percent of the fixed objects struck by vehicles were rigid poles. In 79% of all fixed object collisions, a single motor vehicle left the roadway and struck a roadside object as its primary impact. In the remaining cases (21%), it would appear that the fixed object was struck after impact with another vehicle or pedestrian.

The chances of injury or death occurring were higher in collisions involving two or more vehicles in which a fixed object was struck than in single motor vehicle fixed object collisions. This may reflect the different nature of the types of collisions.

Five collisions in which a fixed object was struck resulted in fatalities. This frequency is approximately three times the rate of occurrence of fatalities in collisions in which no fixed object was involved.

Exhibit 6-1

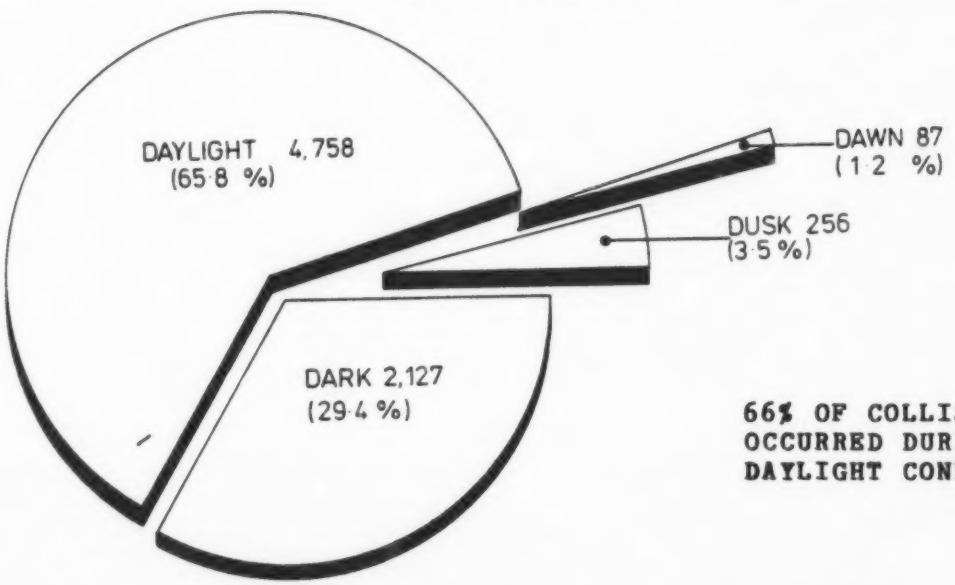
**VISIBILITY CONDITIONS**




**79% OF COLLISIONS OCCURRED DURING CLEAR VISIBILITY CONDITIONS**

Exhibit 6-2

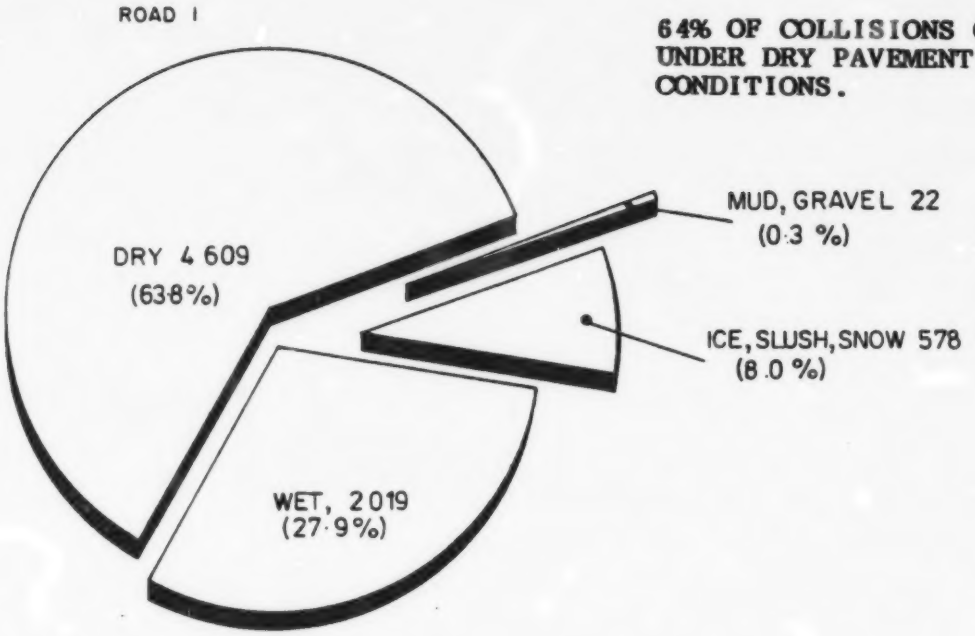
**LIGHT CONDITIONS**




**66% OF COLLISIONS OCCURRED DURING DAYLIGHT CONDITIONS**

Exhibit 6-3

## ROAD 1 SURFACE CONDITIONS




**64% OF COLLISIONS OCCURRED UNDER DRY PAVEMENT CONDITIONS.**

Exhibit 6-4

## ROAD 1 PAVEMENT MARKINGS VERSUS ROAD SURFACE CONDITIONS

| SURFACE \ MARKINGS | GOOD | FAIR | NOT VISIBLE OBSCURED | NONE |
|---|---|---|---|---|
| DRY | 3710<br>51·3 % | 156<br>2·2 % | 34<br>0·4 % | 709<br>9·8 % |
| WET | 1667<br>23·1 % | 88<br>1·2 % | 62<br>0·9 % | 202<br>2·8 % |
| SNOW SLUSH ICE | 175<br>2·4 % | 13<br>0·2 % | 290<br>4·0 % | 100<br>1·4 % |
| MUD GRAVEL | 1<br>0·0 % | 1<br>0·0 % | 2<br>0·0 % | 18<br>0·3 % |

**80% OF COLLISIONS OCCURRED ON MARKED ROADWAYS WHERE THE MARKINGS WERE VISIBLE.**

Exhibit 6-5

## ROAD CHARACTER FOR COLLISIONS OCCURRING AT INTERSECTIONS (a)

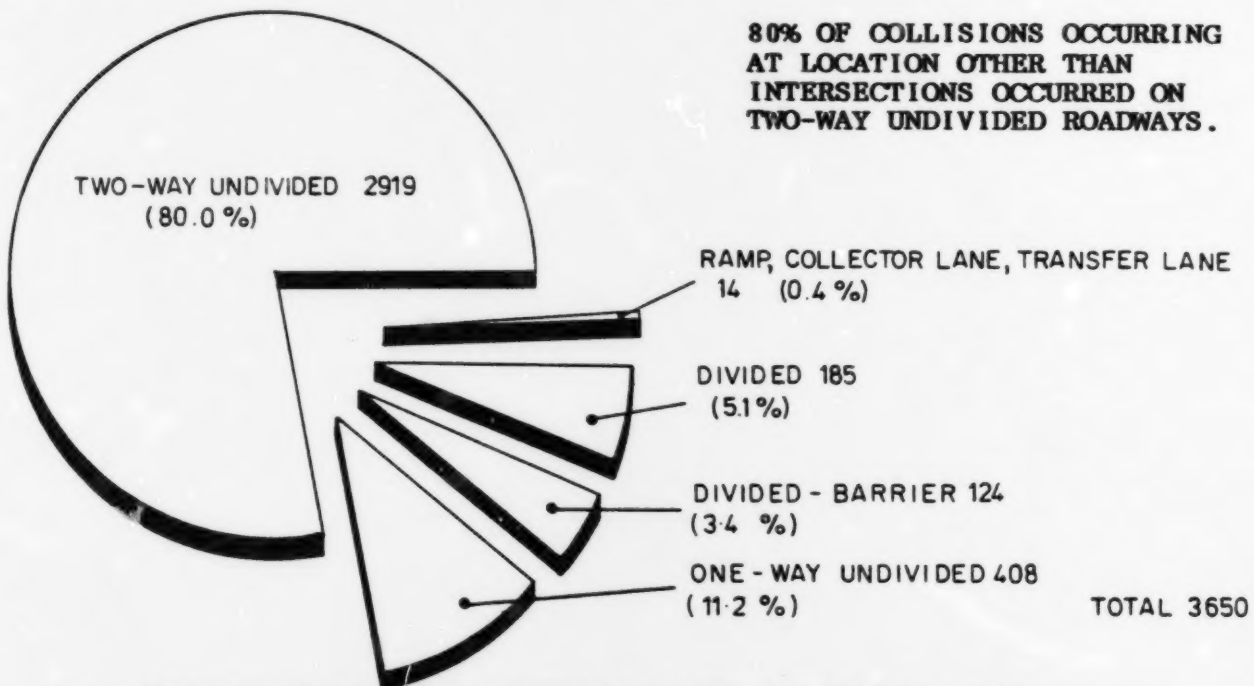
| ROAD 2 \ ROAD 1 | ONE-WAY UNDIVIDED | TWO-WAY UNDIVIDED | DIVIDED BARRIER | DIVIDED | COLLECTOR LANES RAMPS | |
|---|---|---|---|---|---|---|
| ONE-WAY UNDIVIDED | 590 | | | | | |
| TWO-WAY UNDIVIDED | 463 | 2214 | | | | |
| DIVIDED BARRIER | 22 | 31 | 51 | | | |
| DIVIDED | 39 | 75 | 2 | 80 | | |
| COLLECTOR LANES RAMPS | 0 | 4 | 2 | 2 | 3 | |
| TOTAL | 1114 | 2324 | 55 | 82 | 3 | 3578 |

62% OF COLLISIONS AT INTERSECTIONS OCCURRED AT THE INTERSECTION OF TWO-WAY UNDIVIDED ROADWAYS.

Exhibit 6-6

## ROAD CHARACTER FOR COLLISIONS NOT OCCURRING AT INTERSECTIONS(b)

80% OF COLLISIONS OCCURRING AT LOCATION OTHER THAN INTERSECTIONS OCCURRED ON TWO-WAY UNDIVIDED ROADWAYS.




(a) COLLISIONS REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED. DATA INCOMPLETE IN 47 CASES.

(b) COLLISIONS NOT REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED.

Exhibit 6-7

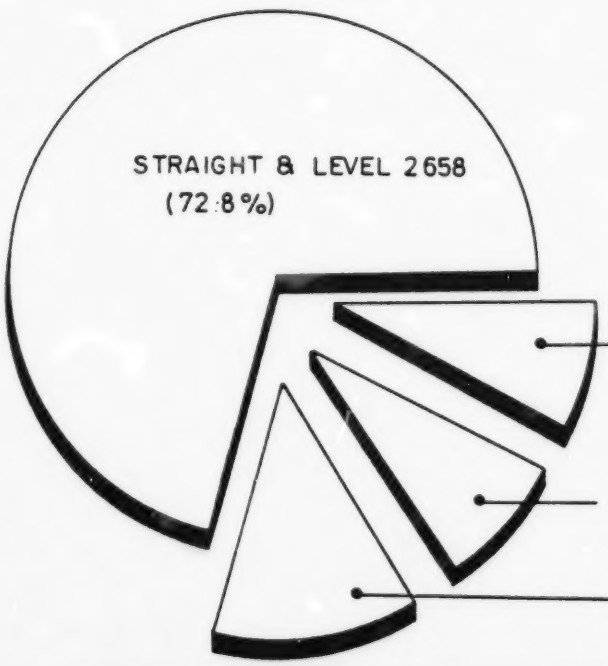
## ROAD ALIGNMENT FOR COLLISIONS OCCURRING AT INTERSECTIONS(a)

| ROAD 2 \ ROAD 1 | STRAIGHT & LEVEL | STRAIGHT ON HILL | CURVE ON LEVEL | CURVE ON HILL | |
|---|---|---|---|---|---|
| STRAIGHT & LEVEL | 3104 | | | | |
| STRAIGHT ON HILL | 178 | 106 | | | |
| CURVE ON LEVEL | 69 | 10 | 44 | | |
| CURVE ON HILL | 24 | 16 | 5 | 21 | |
| TOTALS | 3 375 | 132 | 49 | 21 | 3 577 |

87% OF COLLISIONS OCCURRED AT THE INTERSECTION OF TWO STRAIGHT AND LEVEL ROADWAYS.

Exhibit 6-8

## ROAD ALIGNMENT FOR COLLISIONS NOT OCCURRING AT INTERSECTIONS(b)




73% OF COLLISIONS OCCURRING AT LOCATIONS OTHER THAN INTERSECTIONS OCCURRED ON ROADWAYS WITH STRAIGHT AND LEVEL ALIGNMENT.

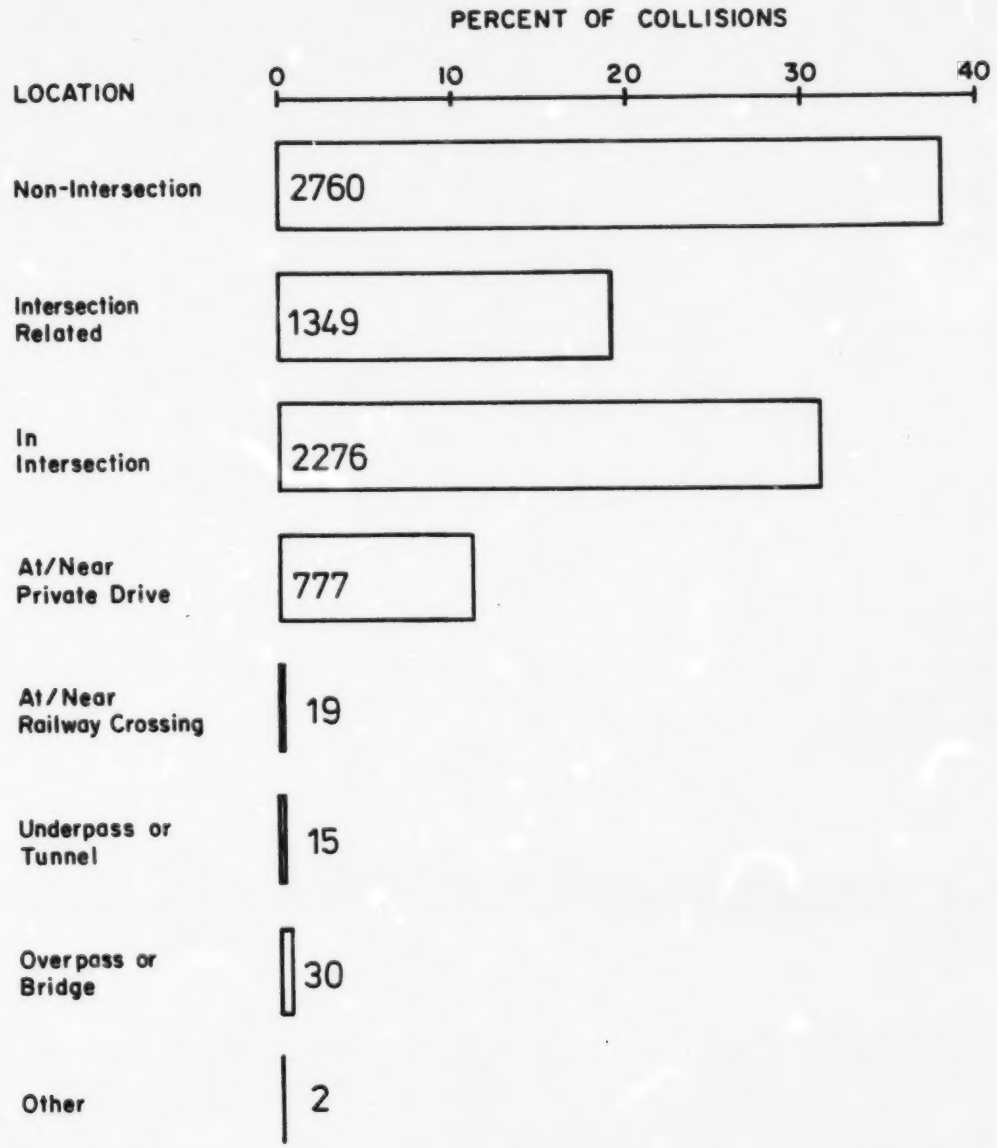
TOTAL 3651

(a) COLLISIONS REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED. DATA INCOMPLETE IN 48 CASES.

(b) COLLISIONS NOT REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED.

Exhibit 6-9

## LOCATION OF COLLISIONS




**50% OF COLLISIONS OCCURRED AT NON-INTERSECTION LOCATIONS.**

Exhibit 6-10

## TRAFFIC CONTROL VS CLASS OF COLLISION

| Traffic Control | Fatal Injury | Non-Fatal Injury | Property Damage Only | Totals | (%) Fatal or Injury Collisions |
|---|---|---|---|---|---|
| Traffic Signal | 3 | 786 | 1,103 | 1,892 | ( 41.7) |
| Stop Sign | 5 | 593 | 939 | 1,537 | ( 38.9) |
| Yield Sign | - | 25 | 37 | 62 | ( 40.3) |
| Police Control | - | - | 1 | 1 | ( - ) |
| School Guard | - | 5 | 2 | 7 | ( 71.4) |
| School Bus | - | 4 | 7 | 11 | ( 36.4) |
| No Control | 10 | 1,307 | 2,379 | 3,696 | ( 35.6) |
| Other | - | 6 | 16 | 22 | ( 27.3) |
| Totals | 18 | 2,726 | 4,484 | 7,228 | ( 38.0) |

**COLLISIONS OCCURRING AT SIGNALIZED INTERSECTIONS HAVE APPROXIMATELY THE SAME CHANCE OF RESULTING IN INJURY AS DO COLLISIONS OCCURRING AT STOP- OR YIELD-CONTROLLED INTERSECTIONS, OR LOCATIONS WITH NO CONTROL.**

Exhibit 6-11

## TRAFFIC CONTROL VS ROAD LOCATION

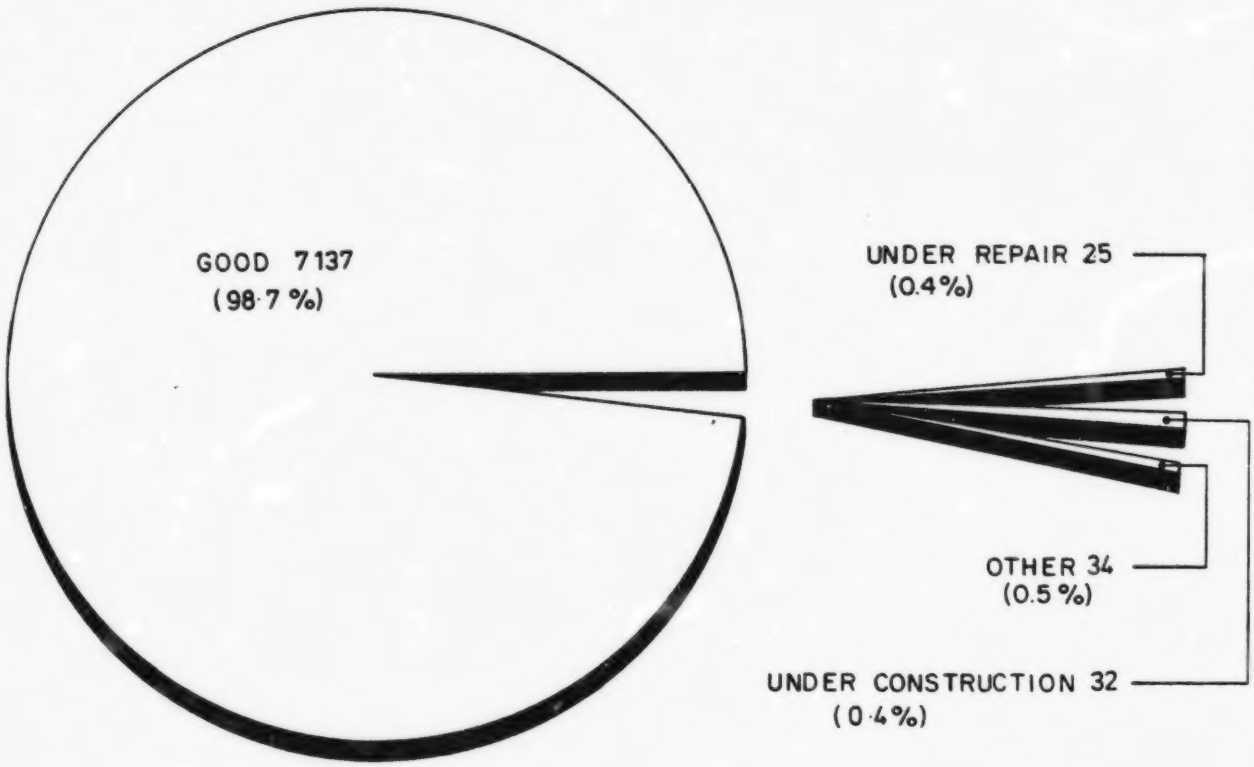
| Distance From Intersection | Traffic Signal | Stop Sign | Yield Sign | Police Control | School Guard | School Bus | No Control | Other | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|
| In Intersection (Within 9 Metres) | 1,503 | 1,272 | 44 | - | 5 | 3 | 736 | 9 | 3,572 | 49.4 |
| 9.1 to 20 Metres | 188 | 129 | 3 | - | 1 | 1 | 608 | 2 | 932 | 12.9 |
| 20.1 to 40 Metres | 105 | 65 | 2 | - | 1 | 2 | 678 | 1 | 854 | 11.8 |
| 40.1 to 60 Metres | 36 | 20 | - | - | - | 1 | 372 | 2 | 431 | 6.0 |
| Over 60 Metres | 67 | 52 | 13 | 1 | - | 4 | 1,294 | 8 | 1,439 | 19.9 |
| | 1,899 | 1,538 | 62 | 1 | 7 | 11 | 3,688 | 22 | 7,228 | 100.0 |

**62% OF ALL COLLISIONS OCCURRED WITHIN 20 METRES OF AN INTERSECTION.**

**21% OF ALL COLLISIONS OCCURRED AT A SIGNALIZED INTERSECTION.**

Exhibit 6-12

## ROAD CONDITION




**99% OF ROADWAYS ON WHICH COLLISIONS OCCURRED WERE IN GOOD CONDITION (I.E. NOT UNDER REPAIR OR UNDER CONSTRUCTION AT THE TIME OF THE COLLISION)**

Exhibit 6-13

## FIXED OBJECTS STRUCK VERSUS ROAD LOCATION

| Object Struck | ROAD LOCATION Non-Intersection | Intersection Related | In Intersection | Private Drive | Railroad Crossing | Underpass or Tunnel | Overpass or Bridge | Other | Total | (%) | % Single Motor Vehicle |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Restraining Barrier | 81 | 13 | 8 | 2 | - | - | 7 | - | 111 | ( 9.9) | 82.0 |
| Rigid Pole | 173 | 61 | 53 | 28 | - | - | 2 | - | 317 | ( 28.3) | 78.6 |
| Break-away Pole | 25 | 9 | 13 | - | 1 | 1 | - | - | 49 | ( 4.4) | 75.5 |
| Tree | 78 | 10 | 4 | 5 | - | - | 1 | - | 98 | ( 8.7) | 89.8 |
| Post (Sign; Parking Meter) | 46 | 16 | 18 | 6 | - | - | 1 | - | 87 | ( 7.8) | 75.9 |
| Fence | 42 | 11 | 14 | 5 | - | 1 | - | - | 73 | ( 6.5) | 71.2 |
| Culvert | 14 | 2 | 2 | 4 | - | - | - | - | 22 | ( 2.0) | 100.0 |
| Bridge Support | 1 | - | - | - | - | 5 | - | - | 6 | ( 0.5) | 100.0 |
| Rock Face | 5 | 1 | 1 | - | - | - | 2 | - | 9 | ( 0.8) | 66.7 |
| Snowbank or Drift | 8 | 4 | 2 | - | - | - | - | - | 14 | ( 1.3) | 42.9 |
| Ditch | 76 | 12 | 12 | 11 | - | 1 | - | - | 112 | ( 10.0) | 92.9 |
| Curb | 34 | 12 | 25 | 5 | - | 1 | - | - | 77 | ( 6.9) | 55.8 |
| Crash Cushion | 3 | 2 | - | - | - | - | - | - | 5 | ( 0.5) | 100.0 |
| Building or Wall | 27 | 7 | 6 | 4 | - | - | - | - | 44 | ( 3.9) | 70.5 |
| Other | 60 | 16 | 11 | 6 | 4 | - | - | - | 97 | ( 8.7) | 82.5 |
| Total | 673 | 176 | 169 | 76 | 5 | 9 | 13 | - | 1,121 | (100.0) | 79.1 |

**28% OF FIXED OBJECTS STRUCK BY ALL VEHICLES WERE RIGID POLES.**
**79% OF COLLISIONS INVOLVING FIXED OBJECTS WERE SINGLE MOTOR VEHICLE COLLISIONS.**

Exhibit 6-14

## FIXED OBJECT VERSUS CLASS OF COLLISION

| Object Struck | Fatal | Personal Injury | Property Damage Only | Total | % Fatal or Injury |
|---|---|---|---|---|---|
| Restraining Barrier | - | 50 | 61 | 111 | 45.1 |
| Rigid Pole | 2 | 139 | 176 | 317 | 44.5 |
| Breakaway Pole | - | 20 | 29 | 49 | 40.8 |
| Tree | 1 | 41 | 56 | 98 | 42.9 |
| Post, Sign, Parking Meter | - | 21 | 66 | 87 | 24.1 |
| Fence | 1 | 18 | 54 | 73 | 26.0 |
| Culvert | - | 9 | 13 | 22 | 40.9 |
| Bridge Support | - | 4 | 4 | 8 | 50.0 |
| Rock Face | - | 2 | 5 | 7 | 28.6 |
| Snowbank or Drift | - | 9 | 5 | 14 | 64.3 |
| Ditch | - | 60 | 52 | 112 | 53.6 |
| Curb | - | 38 | 39 | 77 | 49.4 |
| Crash Cushion | - | 2 | 3 | 5 | 40.0 |
| Building or Wall | - | 17 | 27 | 44 | 38.6 |
| Other | 1 | 27 | 69 | 97 | 28.9 |
| Total | 5 | 457 | 659 | 1,121 | 41.2 |
| Single Motor Vehicle Collisions | 4 (0.4%) | 351 (39.6%) | 532 (60.0%) | 887 (100.0%) | |
| Collisions Involving Two or More Vehicles | 1 (0.4%) | 106 (45.3%) | 127 (54.3%) | 234 (100.0%) | |

**THE PROBABILITY OF INJURY OR DEATH IS HIGHEST FOR COLLISIONS IN WHICH A SNOWBANK OR BRIDGE SUPPORT IS HIT.**

**THE CHANCE OF INJURY OR DEATH IN A COLLISION IN WHICH A FIXED OBJECT IS HIT IS HIGHER WHEN TWO OR MORE VEHICLES ARE INVOLVED.**

**FOUR SINGLE MOTOR VEHICLE COLLISIONS IN WHICH FIXED OBJECTS WERE STRUCK RESULTED IN FATALITIES.**

# Chapter Seven
# Locations

**General**

Locations that have high numbers or rates of collision occurrences have received regular attention by roadway authorities in the Region and countermeasures are constantly being implemented on existing facilities and incorporated into the design of new facilities. However, physical alterations are not effective in preventing the majority of traffic collisions as these are the direct result of driver or pedestrian error.

**Area Municipality**

In general, the collision rate increased with increasing municipality size (Exhibit 7-1).

**High Frequency Intersection Locations**

Exhibit 7-2 represents a list of the 55 locations which experienced the highest number of collision occurrences in 1984. All 1984 collisions occurring at traffic signals were subjected to the control chart analysis technique (Exhibit 7-3). Additional information including collision data from previous years is included with this exhibit.

Exhibit 7-4 shows the relative number of collisions and collision rates for selected groups of signalized intersections.

These exhibits do not necessarily represent priority lists for improvements as other factors have to be taken into account such as cost-benefit considerations or the deployment of other countermeasure opportunities which may be more cost-effective.

In many cases, these locations are already under consideration for various forms of improvement on a priority basis.

**High Frequency Road Section Locations**

Exhibits 7-5, 7-6 and 7-7 portray arterial roadway sections within the City of Hamilton which have the highest collision rates. The criteria for reporting is collisions per million vehicle kilometres travelled per annum. Exhibit 7-5 evaluates roadway sections including all collisions along the roadway. Exhibit 7-6 demonstrates collision rates on roadway sections excluding collisions occurring within 9 metres of a signalized intersection. Exhibit 7-7 shows collision rates on roadway sections excluding collisions occurring at <u>all</u> intersections, signalized or non-signalized. Exhibit 7-8 presents a summary of collision rates for selected groups and subcategories of the arterial system.

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The trends over the past eight years are interesting to note when reviewing Exhibit 7-7. As the overall number of collisions within the City of Hamilton and Region has been dropping since 1977, with traffic volumes relatively constant, collision rates on roadway sections show a parallel decline.

Exhibit 7-1

## COLLISIONS VS AREA MUNICIPALITY

| Municipality | Class of Collision (a) Fatal | Non-Fatal Injury | Property Damage Only | All Collisions | 1984 Collision Rate per 1,000 Pop. (b) |
|---|---|---|---|---|---|
| Ancaster | 1 | 55 | 140 | 196 | 13.3 |
| Dundas | - | 100 | 165 | 265 | 13.5 |
| Flamborough | 1 | 103 | 156 | 260 | 10.6 |
| Glanbrook | - | 52 | 64 | 116 | 12.1 |
| City of Hamilton | 15 | 2,185 | 3,597 | 5,797 | 18.8 |
| Stoney Creek | 1 | 231 | 362 | 594 | 15.8 |
| Total for the Regional Municipality of Hamilton-Wentworth | 18 | 2,726 | 4,484 | 7,228 | 17.4 |

**COLLISION RATE IN TERMS OF COLLISIONS PER 1,000 POPULATION GENERALLY INCREASED WITH INCREASED MUNICIPALITY SIZE.**

(a) Collisions reported to the Hamilton-Wentworth Regional Police only; areas patrolled by the Provincial Police (e.g. Kings Highways) are not included.

(b) 1982 Regional Assessment Office population figures used.

Exhibit 7-2

## INTERSECTIONS WITH HIGHEST NUMBER OF COLLISIONS IN 1984 (a)

| | Intersection | Type of Traffic Control | Number of Collisions | 5 Yr. Avg. |
|---|---|---|---|---|
| 1. | Queenston/Centennial | Traffic Signal | 31 | 24.2 |
| 2. | Main/John | Traffic Signal | 21 | 20.0 |
| 3. | King/Wellington | Traffic Signal | 19 | 11.2 |
| 4. | Barton/Centennial | Traffic Signal | 18 | 14.8 |
| 5. | Main/Victoria | Traffic Signal | 18 | 22.0 |
| 6. | York/Queen | Traffic Signal | 18 | 12.0 |
| 7. | Main/Dundurn | Traffic Signal | 17 | 18.4 |
| 8. | Queenston/Nash | Traffic Signal | 16 | 18.8 |
| 9. | Fennell/Upper Gage | Traffic Signal | 15 | 16.2 |
| 10. | Main/Hess | Traffic Signal | 15 | 7.8 |
| 11. | Mohawk/Upper James | Traffic Signal | 15 | 14.4 |
| 12. | Rymal/Upper James | Traffic Signal | 15 | 12.2 |
| 13. | Fennell/Upper Ottawa | Traffic Signal | 14 | 13.4 |
| 14. | Caroline/Charlton | 1-Way Stop (2 One-Way Streets) | 14 | 10.8 |
| 15. | Mohawk/Upper Ottawa | Traffic Signal | 14 | 13.0 |
| 16. | Mohawk/Upper Paradise | Traffic Signal | 14 | 15.6 |
| 17. | Main/Bay | Traffic Signal | 13 | 13.6 |
| 18. | Barton/Kenora | Traffic Signal | 12 | 8.8 |
| 19. | Barton/Woodward | Traffic Signal | 12 | 16.2 |
| 20. | Hunter/John | Traffic Signal | 12 | 10.8 |
| 21. | King/James | Traffic Signal | 12 | 11.6 |
| 22. | Barton/Parkdale | Traffic Signal | 11 | 10.6 |

| | Intersection | Type of Traffic Control | Number of Collisions | 5 Yr. Avg. |
|---|---|---|---|---|
| 23. | Barton/Wellington | Traffic Signal | 11 | 8.0 |
| 24. | Burlington/Ottawa | Traffic Signal | 11 | 8.0 |
| 25. | Cootes/Olympic | Traffic Signal | 11 | 10.0 |
| 26. | King/Centennial | Traffic Signal | 11 | 15.8 |
| 27. | King/Parkdale | Traffic Signal | 11 | 9.8 |
| 28. | Main/James | Traffic Signal | 11 | 10.8 |
| 29. | Mtn. Brow/Kenilworth Access | Traffic Circle | 11 | 4.4 |
| 30. | Sherman Access/Kenilworth Access | One-Way Stop | 11 | 7.6 |
| 31. | King/Kenilworth | Interchange | 11 | 6.2 |
| 32. | Barton/John | Traffic Signal | 10 | 13.0 |
| 33. | Barton/Hughson | Two-Way Stop | 10 | 5.6 |
| 34. | Cannon/Wellington | Traffic Signal | 10 | 9.0 |
| 35. | King/Dundurn | Traffic Signal | 10 | 13.4 |
| 36. | King/Queen | Traffic Signal | 10 | 9.4 |
| 37. | Limeridge/Upper James | Traffic Signal | 10 | 9.4 |
| 38. | Limeridge/Upper Gage | Traffic Signal | 10 | 10.0 |
| 39. | Main/Longwood | Traffic Signal | 10 | 9.2 |
| 40. | Main/Queen | Traffic Signal | 10 | 7.4 |
| 41. | Mohawk/Garth | Traffic Signal | 10 | 9.6 |
| 42. | Walnut/Young | One-Way Stop | 10 | 5.4 |
| 43. | Aberdeen/Dundurn | Traffic Signal | 9 | 12.0 |
| 44. | Barton/Robins | Private Driveway | 9 | 10.8 |
| 45. | Cannon/Gage | Traffic Signal | 9 | 8.4 |
| 46. | Cannon/James | Traffic Signal | 9 | 9.0 |
| 47. | Cannon/Ferguson | Two-Way Stop | 9 | 6.6 |

| | Intersection | Type of Traffic Control | Number of Collisions | 5 Yr. Avg. |
|---|---|---|---|---|
| 48. | Charlton/Sherman Access | Traffic Signal | 9 | 14.2 |
| 49. | Delawana/Centennial | Traffic Signal | 9 | 8.6 |
| 50. | Fennell/Upper Wentworth | Traffic Signal | 9 | 11.8 |
| 51. | Governors/Main | Traffic Signal | 9 | 6.2 |
| 52. | Gray/Hwy. 8 | Traffic Signal | 9* | 9.4* |
| 53. | King/John | Traffic Signal | 9 | 7.8 |
| 54. | Main/Parkdale | Traffic Signal | 9 | 9.0 |
| 55. | Main/Wellington | Traffic Signal | 9 | 12.0 |
| 56. | Queensdale/Upper Gage | Traffic Signal | 9 | 11.2 |
| 57. | York/Locke | Traffic Signal | 9 | 11.8 |



(a) Only collisions occurring within 31 feet (9.5 m) of the intersection are defined as being "in" the intersection, and are included on this list.

* Only collisions as reported to the Hamilton-Wentworth Regional Police Department.

Exhibit 7-3

## SIGNALIZED INTERSECTIONS WITH HIGHEST COLLISION RATES IN 1984 *

| | Intersection | $R_L$ / $R_C$ | (a) $R_L$ | (b) $R_C$ | Number of Collisions 1984(c) AWDT | 1984 | 1983 | 1982 | 1981 | 5 YR AVG. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Queenston/Centennial | 2.20 | 1.95 | 0.89 | 47,177 | 31 | 19 | 16 | 26 | 24.2 |
| 2. | Fennell/Gage | 1.86 | 1.82 | 0.98 | 24,242 | 15 | 20 | 13 | 18 | 16.2 |
| 3. | Fennell/Ottawa | 1.85 | 1.83 | 0.99 | 24,303 | 14 | 14 | 10 | 15 | 13.4 |
| 4. | Limeridge/Gage(1) | 1.79 | 1.89 | 1.06 | 18,325 | 10 | 4 | 8 | 5 | 7.2 |
| 5. | Hunter/Hess | 1.72 | 2.00 | 1.17 | 9,143 | 6 | 9 | 5 | 5 | 7.4 |
| 6. | King/Wellington | 1.62 | 1.48 | 0.91 | 33,116 | 19 | 7 | 6 | 13 | 11.2 |
| 7. | Main/John | 1.61 | 1.44 | 0.90 | 41,428 | 21 | 16 | 17 | 20 | 20.0 |
| 8. | Rymal/James | 1.59 | 1.51 | 0.95 | 30,556 | 15 | 11 | 14 | 11 | 12.2 |
| 9. | Cootes/Olympic(2) | 1.59 | 1.60 | 1.01 | 18,862 | 11 | 9 | 6 | 3 | 5.8 |
| 10. | Governors/Ogilvie (Dundas) | 1.58 | 1.71 | 1.08 | 13,406 | 8 | 7 | 1 | 7 | 6.0 |
| 11. | Mohawk/Paradise | 1.57 | 1.51 | 0.96 | 28,844 | 14 | 15 | 20 | 16 | 15.6 |
| 12. | Barton/John | 1.54 | 1.57 | 1.02 | 18,177 | 10 | 18 | 9 | 13 | 13.0 |
| 13. | Hunter/John | 1.53 | 1.51 | 0.99 | 21,184 | 12 | 10 | 7 | 11 | 10.8 |
| 14. | York/Queen | 1.47 | 1.33 | 0.91 | 37,981 | 18 | 8 | 10 | 13 | 12.0 |
| 15. | Limeridge/Garth | 1.43 | 1.51 | 1.06 | 18,315 | 8 | 6 | 3 | 3 | 5.2 |
| 16. | Charlton/Hess | 1.41 | 1.64 | 1.16 | 9,900 | 5 | 7 | 2 | 4 | 4.4 |
| 17. | Charlton/Sherman Access | 1.41 | 1.45 | 1.03 | 16,245 | 9 | 12 | 16 | 14 | 14.2 |
| 18. | Queenston/Nash | 1.40 | 1.29 | 0.92 | 34,208 | 16 | 21 | 15 | 16 | 18.8 |
| 19. | Governors/Main (Dundas) | 1.37 | 1.40 | 1.02 | 18,723 | 9 | 3 | 5 | 7 | 6.2 |
| 20. | Queensdale/Gage | 1.35 | 1.38 | 1.02 | 17,636 | 9 | 11 | 2 | 19 | 11.2 |
| 21. | Main/Victoria | 1.31 | 1.17 | 0.89 | 45,551 | 18 | 14 | 23 | 31 | 22.0 |
| 22. | Main/Hess | 1.28 | 1.17 | 0.91 | 36,301 | 15 | 3 | 7 | 9 | 7.8 |

| | Intersection | $R_L$ / $R_C$ | (a) $R_L$ | (b) $R_C$ | 1984(c) AWDT | Number of Collisions 1984 | 1983 | 1982 | 1981 | 5 YR AVG. |
|---|---|---|---|---|---|---|---|---|---|---|
| 23. | Britannia/Kenilworth | 1.27 | 1.31 | 1.27 | 17,750 | 8 | 4 | 4 | 7 | 5.6 |
| 24. | Greenhill/Mt. Albion | 1.26 | 1.34 | 1.06 | 15,331 | 7 | 4 | 8 | 5 | 5.8 |
| 25. | Fennell/Wentworth | 1.26 | 1.27 | 1.00 | 22,354 | 9 | 20 | 10 | 11 | 11.8 |
| 26. | Main/Parkdale | 1.26 | 1.27 | 1.01 | 20,809 | 9 | 6 | 9 | 13 | 9.0 |
| 27. | Barton/Kenora | 1.25 | 1.18 | 0.95 | 28,735 | 12 | 9 | 5 | 12 | 8.8 |
| 28. | Barton/Wellington | 1.23 | 1.19 | 0.96 | 22,972 | 11 | 5 | 12 | 6 | 8.0 |
| 29. | Aberdeen/Dundurn | 1.17 | 1.16 | 0.99 | 20,810 | 9 | 12 | 14 | 13 | 12.0 |
| 30. | Barton/Centennial | 1.15 | 1.00 | 0.87 | 47,191 | 18 | 6 | 13 | 15 | 14.8 |
| 31. | Barton/Woodward | 1.15 | 1.07 | 0.93 | 30,239 | 12 | 20 | 18 | 13 | 16.2 |
| 32. | King NB/James | 1.15 | 1.07 | 0.93 | 31,240 | 12 | 9 | 13 | 9 | 11.6 |
| 33. | Main/Dundurn | 1.14 | 1.00 | 0.88 | 43,955 | 17 | 22 | 17 | 18 | 18.4 |
| 34. | King/Parkdale | 1.14 | 1.09 | 0.95 | 30,491 | 11 | 8 | 10 | 11 | 9.8 |
| 35. | Barton/Frederick | 1.13 | 1.13 | 1.01 | 18,467 | 8 | 6 | 1 | 8 | 6.8 |
| 36. | Burlington/Ottawa | 1.13 | 1.07 | 0.95 | 32,044 | 11 | 6 | 5 | 6 | 8.0 |
| 37. | Limeridge/James | 1.13 | 1.08 | 0.96 | 27,359 | 10 | 10 | 11 | 11 | 9.4 |
| 38. | Mohawk/James | 1.13 | 1.01 | 0.89 | 47,746 | 15 | 13 | 15 | 18 | 14.4 |
| 39. | Wilson/John | 1.10 | 1.10 | 1.00 | 21,356 | 8 | 6 | 8 | 5 | 6.6 |
| 40. | Lawrence/Rosedale | 1.05 | 1.15 | 1.09 | 12,734 | 5 | 3 | 5 | 2 | 4.2 |
| 41. | Mohawk/Garth | 1.05 | 0.99 | 0.95 | 26,138 | 10 | 7 | 4 | 12 | 9.6 |
| 42. | Cannon/Wellington | 1.04 | 0.98 | 0.95 | 25,614 | 10 | 11 | 5 | 9 | 9.0 |

| | Intersection | $R_L$ / $R_C$ | (a) $R_L$ | (b) $R_C$ | 1984(c) AWDT | Number of Collisions 1984 | 1983 | 1982 | 1981 | 5 YR AVG. |
|---|---|---|---|---|---|---|---|---|---|---|
| 43. | Barton/Sherman | 1.01 | 0.99 | 0.98 | 21,343 | 8 | 1 | 9 | 7 | 6.0 |
| 44. | King/Cochrane | 1.01 | 1.00 | 0.98 | 22,502 | 8 | 4 | 8 | 10 | 7.6 |
| 45. | Main/Bay | 1.00 | 0.90 | 0.90 | 40,726 | 13 | 12 | 11 | 14 | 13.6 |
| 46. | Mohawk/Gage | 1.00 | 0.98 | 0.98 | 27,882 | 8 | 8 | 6 | 8 | 10.8 |

(1) Signal installation date 83 06 20

(2) Signal installation date 82 11 02

**NOTES:**

(a) $R_L$ is the number of collisions per million vehicles entering occurring within 31 feet of an individual intersection in 1984.

(b) $R_C$ is a volume-adjusted critical rate. If $R_L$ exceeds $R_C$ (i.e. $\frac{R_L}{R_C}$ is greater than 1.00), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$R_C = R_a + K\sqrt{\frac{R_a}{m}} - \frac{0.5}{m}$$

where $R_a$ = systemwide average collision rate for all traffic signal locations (0.60 collisions per million vehicle entries in 1984.)

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure at the location in million vehicles entering per year $\frac{(AWDT \times 349.6)}{10^6}$

(c) AWDT - Average Weekday Daily Traffic; AADT - Average Annual Daily Traffic.

(*) Note: Rates presented are for 1984 only. Rates may fluctuate significantly from year to year. Therefore, caution should be exercised when drawing conclusions from the above table.

Exhibit 7-4

**OVERALL COLLISION RATES FOR SELECTED GROUPS OF SIGNALIZED INTERSECTIONS**

| Intersections Included | Data for 1984 Only: Avg. No. of Collisions Per Year | Data for 1984 Only: Rate (Collisions/ Million Vehicles Entering) | Data for 1980-1984: Avg. No. of Collisions Per Year | Data for 1980-1984: Rate (Collisions/ Million Vehicles Entering) |
|---|---|---|---|---|
| All intersections | 4.91 | 0.60 | 5.75 | 0.70 |
| Intersections of one-way streets with one-way streets | 5.57 | 0.64 | 6.00 | 0.69 |
| Intersections of one-way streets with two-way streets | 3.94 | 0.48 | 4.77 | 0.58 |
| Intersections of two-way streets with two-way streets | 4.90 | 0.61 | 5.94 | 0.74 |
| Central business district intersections | 5.29 | 0.60 | 5.98 | 0.68 |
| C.B.D. fringe or industrial intersections | 4.85 | 0.60 | 5.55 | 0.68 |
| Suburban shopping-type intersections | 5.78 | 0.63 | 6.83 | 0.74 |
| Residential area intersections | 3.86 | 0.55 | 4.50 | 0.64 |
| All lower city intersections | 4.98 | 0.58 | 5.76 | 0.67 |
| All mountain intersections | 5.02 | 0.67 | 6.24 | 0.83 |

**THERE HAVE BEEN NO MARKED CHANGES IN THE OVERALL COLLISION RATES FROM 1983 TO 1984.**

**HOWEVER, THERE HAVE BEEN SOME CHANGES IN THE INDIVIDUAL SUBSECTIONS.**

Exhibit 7-5

## ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1980 - 1984
## CITY OF HAMILTON ARTERIALS
## (ALL INTERSECTIONS INCLUDED) (a)

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Kenilworth | Main | Barton | 267.5 | 11.58 | 5.02 | 2.31 | 1.031 | 12,820 | 4.62 | 11.90 |
| 2. | Charlton | James | John | 47.0 | 15.67 | 6.90 | 2.27 | .244 | 7,000 | 0.60 | 17.50 |
| 3. | Barton | James | Wellington | 238.0 | 11.04 | 5.06 | 2.18 | .236 | 14,753 | 4.31 | 10.44 |
| 4. | Barton | Ottawa | Kenilworth | 295.0 | 9.19 | 4.83 | 1.90 | .860 | 21,355 | 6.42 | 9.42 |
| 5. | John | St. Josephs | King | 238.5 | 9.33 | 4.96 | 1.88 | .976 | 14,970 | 5.11 | 8.12 |
| 6. | Barton | Gage | Ottawa | 277.0 | 8.86 | 4.84 | 1.83 | .860 | 20,775 | 6.25 | 7.04 |
| 7. | Barton | Wentworth | Sherman | 223.5 | 9.03 | 4.98 | 1.81 | .842 | 16,817 | 4.95 | 8.28 |
| 8. | Barton | Wellington | Wentworth | 206.5 | 8.48 | 4.99 | 1.70 | .872 | 15,987 | 4.87 | 6.26 |
| 9. | John | King | Barton | 105.5 | 9.17 | 5.52 | 1.66 | .872 | 7,540 | 2.30 | 6.09 |
| 10. | Queen | Aberdeen | King | 171.5 | 8.41 | 5.10 | 1.65 | 1.238 | 9,430 | 4.08 | 7.60 |
| 11. | Cannon | James | Wellington | 204.0 | 8.08 | 4.96 | 1.63 | .854 | 16,928 | 5.05 | 8.02 |
| 12. | Garth | Limeridge | Mohawk | 40.0 | 10.67 | 6.64 | 1.61 | .457 | 4,700 | 0.75 | 6.67 |
| 13. | Barton | Queen | James | 96.5 | 8.73 | 5.56 | 1.57 | .872 | 7,260 | 2.21 | 9.28 |
| 14. | James | King | Barton | 124.0 | 8.29 | 5.32 | 1.56 | .860 | 9,950 | 2.99 | 7.36 |
| 15. | Charlton | Queen | James | 111.0 | 8.38 | 5.41 | 1.55 | .823 | 9,213 | 2.65 | 9.25 |
| 16. | Main | James | Wellington | 310.5 | 7.22 | 4.68 | 1.54 | .866 | 28,393 | 8.60 | 7.03 |
| 17. | Barton | Sherman | Gage | 223.5 | 7.45 | 4.87 | 1.53 | .872 | 19,667 | 6.00 | 6.83 |
| 18. | James | Freeman | King | 190.0 | 7.27 | 4.94 | 1.47 | 1.205 | 12,410 | 5.23 | 6.50 |
| 19. | Fennell | U. Gage | U. Ottawa | 120.5 | 7.68 | 5.28 | 1.45 | .824 | 10,895 | 3.14 | 8.12 |
| 20. | Fennell | U. Ottawa | U. Kenilworth | 57.0 | 8.57 | 6.02 | 1.42 | .878 | 4,326 | 1.33 | 7.14 |

(a) See Notes, Page 101

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21. | Parkdale | Main | Barton | 193.5 | 6.85 | 4.90 | 1.40 | 1.013 | 15,952 | 5.65 | 5.75 |
| 22. | Bay | Herkimer | King | 107.5 | 7.26 | 5.33 | 1.36 | .924 | 9,150 | 2.96 | 6.25 |
| 23. | U. Gage | Fennell | Concession | 143.0 | 6.57 | 5.06 | 1.30 | 1.043 | 11,930 | 4.35 | 6.09 |
| 24. | Main | Queen | James | 265.0 | 6.09 | 4.67 | 1.30 | .830 | 29,980 | 8.70 | 7.18 |
| 25. | Britannia | Barons | Strathearne | 77.5 | 7.18 | 5.58 | 1.29 | .488 | 12,685 | 2.16 | 3.70 |
| 26. | Barton | Nash | Centennial | 209.0 | 6.15 | 4.80 | 1.28 | .836 | 23,277 | 6.80 | 5.96 |
| 27. | Victoria | Stinson | King | 79.0 | 7.02 | 5.54 | 1.27 | .488 | 13,210 | 2.25 | 5.33 |
| 28. | Mohawk | U. Paradise | Garth | 180.5 | 6.13 | 4.88 | 1.26 | .839 | 20,095 | 5.89 | 7.22 |
| 29. | Ottawa | Main | Barton | 145.0 | 6.28 | 5.02 | 1.25 | 1.031 | 12,820 | 4.62 | 4.65 |
| 30. | Fennell | U. Wentworth | U. Sherman | 133.0 | 6.24 | 5.07 | 1.23 | .854 | 14,255 | 4.26 | 4.69 |
| 31. | Main | Wellington | Wentworth | 244.0 | 5.71 | 4.68 | 1.22 | .854 | 28,636 | 8.55 | 4.74 |
| 32. | King | James | Wellington | 185.5 | 5.87 | 4.84 | 1.21 | .878 | 20,582 | 6.32 | 5.14 |
| 33. | Wilson | James | Wellington | 137.0 | 6.09 | 5.04 | 1.21 | .860 | 14,965 | 4.50 | 4.78 |
| 34. | U. Wentworth | Mohawk | Fennell | 62.5 | 6.94 | 5.74 | 1.21 | 1.037 | 4,955 | 1.80 | 11.11 |
| 35. | Queen | King | Barton | 65.0 | 6.60 | 5.66 | 1.17 | .823 | 6,830 | 1.97 | 7.61 |
| 36. | Cannon | Sherman | Gage | 141.0 | 5.86 | 5.00 | 1.17 | .891 | 15,443 | 4.81 | 5.30 |
| 37. | Charlton | Wellington | Wentworth | 92.5 | 6.15 | 5.31 | 1.16 | .854 | 10,085 | 3.01 | 5.98 |
| 38. | Ottawa | Barton | Industrial | 160.0 | 5.64 | 4.90 | 1.15 | 1.279 | 12,673 | 5.67 | 5.03 |
| 39. | Cannon | Gage | Ottawa | 135.5 | 5.69 | 5.00 | 1.14 | .866 | 15,735 | 4.76 | 6.30 |
| 40. | Barton | Kenilworth | Parkdale | 305.5 | 5.13 | 4.53 | 1.13 | 1.525 | 22,355 | 11.92 | 4.03 |
| 41. | U. Wentworth | Fennell | Concession | 57.5 | 6.46 | 5.75 | 1.12 | 1.031 | 4,930 | 1.78 | 8.99 |
| 42. | Gage | Lawrence | King | 84.0 | 5.81 | 5.34 | 1.09 | .982 | 8,405 | 2.89 | 2.77 |
| 43. | Fennell | U. Sherman | U. Gage | 84.0 | 5.85 | 5.35 | 1.09 | .781 | 10,510 | 2.87 | 3.48 |
| 44. | Mohawk | U. Sherman | U. Gage | 109.0 | 5.38 | 5.10 | 1.05 | .781 | 14,835 | 4.05 | 3.83 |
| 45. | York | Queen | James | 127.0 | 5.22 | 4.99 | 1.05 | .921 | 15,120 | 4.87 | 4.41 |
| 46. | King | Parkdale | Nash | 300.5 | 4.75 | 4.51 | 1.05 | 1.708 | 21,207 | 12.66 | 4.30 |

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 47. | Wentworth | Charlton | King | 56.5 | 5.95 | 5.69 | 1.05 | .851 | 6,375 | 1.90 | 7.37 |
| 48. | Parkdale | Barton | Burlington | 185.5 | 4.93 | 4.74 | 1.04 | 1.421 | 15,155 | 7.53 | 3.52 |
| 49. | King | Wellington | Wentworth | 181.0 | 4.86 | 4.75 | 1.02 | .866 | 24,610 | 7.45 | 5.03 |
| 50. | Cannon | Queen | James | 130.0 | 4.98 | 4.95 | 1.01 | .848 | 17,592 | 5.22 | 4.02 |
| 51. | U. Wellington | Fennell | Concession | 129.0 | 5.03 | 4.96 | 1.01 | 1.031 | 14,240 | 5.13 | 4.68 |
| 52. | Bay | King | Barton | 56.0 | 5.63 | 5.65 | 1.00 | .854 | 6,660 | 1.99 | 5.28 |

Exhibit 7-6

## ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1980 - 1984
## CITY OF HAMILTON ARTERIALS
## (SIGNALIZED INTERSECTIONS NOT INCLUDED) (a)

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Charlton | James | John | 44.0 | 14.67 | 4.98 | 2.95 | .244 | 7,000 | 0.60 | 15.00 |
| 2. | Kenilworth | Main | Barton | 218.5 | 9.46 | 3.57 | 2.65 | 1.031 | 12,820 | 4.62 | 9.31 |
| 3. | Barton | James | Wellington | 171.0 | 7.94 | 3.60 | 2.21 | .836 | 14,753 | 4.31 | 7.42 |
| 4. | Barton | Gage | Ottawa | 225.0 | 7.20 | 3.43 | 2.10 | .860 | 20,775 | 6.25 | 5.92 |
| 5. | Barton | Ottawa | Kenilworth | 226.0 | 7.04 | 3.42 | 2.06 | .860 | 21,355 | 6.42 | 7.32 |
| 6. | Barton | Queen | James | 90.0 | 8.14 | 3.99 | 2.04 | .872 | 7,260 | 2.21 | 7.69 |
| 7. | Barton | Wellington | Wentworth | 151.0 | 6.20 | 3.54 | 1.75 | .872 | 15,987 | 4.87 | 5.13 |
| 8. | Barton | Wentworth | Sherman | 150.0 | 6.06 | 3.53 | 1.72 | .842 | 16,817 | 4.95 | 5.86 |
| 9. | Britannia | Barons | Strathearne | 69.5 | 6.44 | 4.00 | 1.61 | .488 | 12,685 | 2.16 | 3.24 |
| 10. | Barton | Sherman | Gage | 162.0 | 5.40 | 3.44 | 1.57 | .872 | 19,667 | 6.00 | 5.00 |
| 11. | Charlton | Queen | James | 80.0 | 6.04 | 3.87 | 1.56 | .823 | 9,213 | 2.65 | 7.17 |
| 12. | Ottawa | Main | Barton | 115.0 | 4.98 | 3.57 | 1.39 | 1.031 | 12,820 | 4.62 | 3.46 |
| 13. | Fennell | U. Gage | U. Ottawa | 81.0 | 5.16 | 3.77 | 1.37 | .824 | 10,895 | 3.14 | 6.05 |
| 14. | Fennell | U. Ottawa | U. Kenilworth | 39.5 | 5.94 | 4.34 | 1.37 | .878 | 4,326 | 1.33 | 4.51 |
| 15. | Garth | Limeridge | Mohawk | 24.0 | 6.40 | 4.80 | 1.33 | .457 | 4,700 | 0.75 | 1.33 |
| 16. | Ottawa | Barton | Industrial | 127.0 | 4.48 | 3.47 | 1.29 | 1.279 | 12,673 | 5.67 | 4.23 |
| 17. | U. Wentworth | Mohawk | Fennell | 48.0 | 5.33 | 4.13 | 1.29 | 1.037 | 4,955 | 1.80 | 9.44 |
| 18. | Queen | Aberdeen | King | 94.0 | 4.61 | 3.63 | 1.27 | 1.238 | 9,430 | 4.08 | 4.41 |
| 19. | Mohawk | U. Paradise | Garth | 127.0 | 4.31 | 3.45 | 1.25 | .839 | 20,095 | 5.89 | 5.43 |
| 20. | Fennell | U. Wentworth | U. Sherman | 96.0 | 4.51 | 3.61 | 1.25 | .854 | 14,255 | 4.26 | 3.76 |

(a) See Notes, Page 101

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21. | John | King | Barton | 56.0 | 4.87 | 3.96 | 1.23 | .872 | 7,540 | 2.30 | 3.48 |
| 22. | Cannon | Gage | Ottawa | 103.0 | 4.33 | 3.55 | 1.22 | .866 | 15,735 | 4.76 | 5.46 |
| 23. | Cannon | Sherman | Gage | 102.0 | 4.24 | 3.55 | 1.19 | .891 | 15,443 | 4.81 | 4.37 |
| 24. | Barton | Nash | Centennial | 136.0 | 4.00 | 3.39 | 1.18 | .836 | 23,277 | 6.80 | 3.09 |
| 25. | James | Freeman | King | 108.0 | 4.13 | 3.51 | 1.18 | 1.205 | 12,410 | 5.23 | 3.82 |
| 26. | Parkdale | Main | Barton | 116.0 | 4.11 | 3.47 | 1.18 | 1.013 | 15,952 | 5.65 | 3.19 |
| 27. | King | Kenilworth | Parkdale | 206.5 | 3.73 | 3.20 | 1.17 | 1.513 | 20,922 | 11.07 | 4.43 |
| 28. | Queenston | Nash | Hamilton City Limit | 144.0 | 3.91 | 3.36 | 1.16 | .823 | 25,585 | 7.36 | 3.40 |
| 29. | James | King | Barton | 66.0 | 4.41 | 3.80 | 1.16 | .860 | 9,950 | 2.99 | 5.69 |
| 30. | Barton | Kenilworth | Parkdale | 215.0 | 3.61 | 3.18 | 1.14 | 1.525 | 22,355 | 11.92 | 2.77 |
| 31. | King | Gage | Main | 83.0 | 4.13 | 3.64 | 1.13 | .610 | 18,830 | 4.02 | 2.24 |
| 32. | King | Wellington | Wentworth | 140.0 | 3.76 | 3.35 | 1.12 | .866 | 24,610 | 7.45 | 4.03 |
| 33. | Wentworth | Charlton | King | 43.5 | 4.58 | 4.09 | 1.12 | .851 | 6,375 | 1.90 | 5.79 |
| 34. | Wentworth | Barton | Burlington | 46.0 | 4.47 | 4.03 | 1.11 | 1.031 | 5,725 | 2.06 | 3.88 |
| 35. | Gage | Lawrence | King | 61.0 | 4.22 | 3.82 | 1.10 | .982 | 8,405 | 2.89 | 2.08 |
| 36. | Cannon | James | Wellington | 98.0 | 3.88 | 3.52 | 1.10 | .854 | 16,928 | 5.05 | 4.95 |
| 37. | Mohawk | U. Sherman | U. Gage | 80.0 | 3.95 | 3.63 | 1.09 | .781 | 14,835 | 4.05 | 2.96 |
| 38. | Main | James | Wellington | 154.0 | 3.58 | 3.30 | 1.08 | .866 | 28,393 | 8.06 | 3.60 |
| 39. | Sherman | Main | King | 33.0 | 4.62 | 4.29 | 1.08 | .427 | 9,600 | 1.43 | 4.20 |
| 40. | U. Wellington | Fennell | Concession | 95.0 | 3.70 | 3.52 | 1.05 | 1.031 | 14,240 | 5.13 | 3.51 |
| 41. | U. James | Limeridge | Mohawk | 138.0 | 3.50 | 3.33 | 1.05 | 1.049 | 21,490 | 7.88 | 3.68 |
| 42. | Main | Gage | Ottawa | 127.0 | 3.46 | 3.36 | 1.03 | .866 | 24,290 | 7.35 | 2.99 |
| 43. | King | Parkdale | Nash | 203.0 | 3.21 | 3.16 | 1.02 | 1.708 | 21,207 | 12.66 | 3.00 |
| 44. | Parkdale | Barton | Burlington | 128.0 | 3.40 | 3.35 | 1.01 | 1.421 | 15,155 | 7.53 | 2.66 |
| 45. | Main | Sherman | Gage | 122.0 | 3.37 | 3.36 | 1.00 | .872 | 23,767 | 7.25 | 4.55 |

Exhibit 7-7

## ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1980 - 1984
## CITY OF HAMILTON ARTERIALS
## (INTERSECTIONS NOT INCLUDED) (a)

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Barton | Nash | Centennial | 136.0 | 4.00 | 2.20 | 1.82 | .836 | 23,277 | 6.80 | 3.09 |
| 2. | Barton | Ottawa | Kenilworth | 129.0 | 4.02 | 2.22 | 1.81 | .860 | 21,355 | 6.42 | 4.67 |
| 3. | Fennell | U. Gage | U. Ottawa | 67.0 | 4.27 | 2.48 | 1.72 | .824 | 10,895 | 3.14 | 6.05 |
| 4. | Kenilworth | Main | Barton | 86.0 | 3.72 | 2.33 | 1.60 | 1.031 | 12,820 | 4.62 | 3.90 |
| 5. | Barton | Gage | Ottawa | 111.0 | 3.55 | 2.23 | 1.59 | .860 | 20,775 | 6.25 | 2.88 |
| 6. | Barton | James | Wellington | 77.0 | 3.57 | 2.36 | 1.51 | .836 | 14,753 | 4.31 | 2.78 |
| 7. | Mohawk | U. Paradise | Garth | 99.0 | 3.36 | 2.25 | 1.49 | .839 | 20,095 | 5.89 | 4.75 |
| 8. | Garth | Limeridge | Mohawk | 17.0 | 4.53 | 3.17 | 1.43 | .457 | 4,700 | 0.75 | 1.33 |
| 9. | U. James | Limeridge | Mohawk | 121.0 | 3.07 | 2.16 | 1.42 | 1.049 | 21,490 | 7.88 | 3.30 |
| 10. | Main | James | Wellington | 128.0 | 2.98 | 2.13 | 1.40 | .866 | 28,393 | 8.60 | 2.91 |
| 11. | Parkdale | Main | Barton | 86.0 | 3.04 | 2.26 | 1.35 | 1.013 | 15,952 | 5.65 | 2.30 |
| 12. | Charlton | James | John | 13.0 | 4.33 | 3.28 | 1.32 | .244 | 7,000 | 0.60 | 5.00 |
| 13. | Barton | Wentworth | Sherman | 75.0 | 3.03 | 2.31 | 1.31 | .842 | 16,817 | 4.95 | 2.22 |
| 14. | Queenston | Nash | Hamilton City Limit | 101.0 | 2.74 | 2.18 | 1.26 | .823 | 25,585 | 7.36 | 2.72 |
| 15. | Ottawa | Barton | Industrial | 80.0 | 2.82 | 2.26 | 1.25 | 1.279 | 12,673 | 5.67 | 2.82 |
| 16. | Barton | Wellington | Wentworth | 69.0 | 2.83 | 2.31 | 1.23 | .872 | 15,987 | 4.87 | 1.64 |
| 17. | Barton | Sherman | Gage | 82.0 | 2.73 | 2.24 | 1.22 | .872 | 19,667 | 6.00 | 3.50 |
| 18. | John | King | Barton | 36.0 | 3.13 | 2.62 | 1.19 | .872 | 7,540 | 2.30 | 2.17 |
| 19. | Barton | Kenilworth | Parkdale | 141.0 | 2.37 | 2.04 | 1.16 | 1.525 | 22,355 | 11.92 | 1.59 |
| 20. | Fennell | U. Ottawa | U. Kenilworth | 22.0 | 3.31 | 2.88 | 1.15 | .878 | 4,326 | 1.33 | 2.26 |

(a) See Notes, Page 101

| | Arterial Street | From | To | Number of Collisions | $R_L$ | $R_C$ | Ratio | Link Length | Link Volume | Million Veh-Km | 1984 $R_L$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21. | James | King | Barton | 43.0 | 2.88 | 2.50 | 1.15 | .860 | 9,950 | 2.99 | 3.34 |
| 22. | James | Freeman | King | 68.0 | 2.60 | 2.29 | 1.14 | 1.205 | 12,410 | 5.23 | 2.10 |
| 23. | U. Wentworth | Mohawk | Fennell | 28.0 | 3.11 | 2.73 | 1.14 | 1.037 | 4,955 | 1.80 | 5.56 |
| 24. | King | Parkdale | Nash | 145.0 | 2.29 | 2.03 | 1.13 | 1.708 | 21,207 | 12.66 | 2.37 |
| 25. | Queenston | Parkdale | Nash | 129.0 | 2.24 | 2.05 | 1.09 | 1.623 | 20,286 | 11.51 | 1.74 |
| 26. | Wentworth | King | Barton | 28.0 | 2.89 | 2.69 | 1.07 | .820 | 6,765 | 1.94 | 1.03 |
| 27. | York | Queen | James | 59.0 | 2.42 | 2.31 | 1.05 | .921 | 15,120 | 4.87 | 2.26 |
| 28. | Ottawa | Main | Barton | 56.0 | 2.42 | 2.33 | 1.04 | 1.031 | 12,820 | 4.62 | 1.95 |
| 29. | Fennell | U. Wentworth | U. Sherman | 52.0 | 2.44 | 2.36 | 1.03 | .854 | 14,255 | 4.26 | 2.11 |
| 30. | Gage | Lawrence | King | 37.0 | 2.56 | 2.52 | 1.02 | .982 | 8,405 | 2.89 | 1.38 |
| 31. | King | James | Wellington | 71.0 | 2.25 | 2.22 | 1.01 | .878 | 20,582 | 6.32 | 2.22 |
| 32. | Main | Queen | James | 93.0 | 2.14 | 2.13 | 1.00 | .830 | 29,980 | 8.70 | 2.64 |

NOTES Re: Collision Rates on Roadway Sections

(a) Exhibit 7-5 includes all collisions on an arterial roadway section. If the roadway section ends at an intersection, signalized or unsignalized, one-half the number of collisions occurring at the intersection is included.

(b) Exhibit 7-6 includes all collisions on an arterial roadway section excluding those which occur within nine metres of a signalized intersection. If the roadway section ends at an unsignalized intersection, one-half the number of collisions occurring at the intersection is included.

(c) Exhibit 7-7 includes only collisions on an arterial roadway section which occur greater than nine metres from any intersection. That is, no collisions referenced to an intersection, signalized or unsignalized, are included.

(d) $R_L$ is the collision rate for the roadway section expressed as collisions per million vehicle kilometres travelled per annum.

(e) $R_C$ is a volume-adjusted critical rate. If $R_L$ exceeds $R_C$ (i.e. $\frac{R_L}{R_C}$ is greater than 1.00), one can state with 95 percent confidence that the collision rate for the roadway section in question is significantly higher than would normally be expected.

$$R_C = R_a + K\sqrt{\frac{R_a}{m}} - \frac{0.5}{m}$$

where $R_a$ = systemwide average collision rate for all roadway sections (3.66 collisions per million vehicle kilometers in 1980-1984 for Exhibit 7-5; 2.47 collisions per million vehicle kilometres in 1980-1984 for Exhibit 7-6; 1.50 collisions per million vehicle kilometres in 1980-1984 for Exhibit 7-7).

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure for the individual roadway section in million vehicle kilometres per year

$$(AWDT \times \frac{349.6}{10^6} \times \text{Section Length})$$

(f) AWDT - Average Weekday Daily Traffic

Exhibit 7-8

## ARTERIAL ROADWAY SECTIONS
## COLLISION RATES
## FOR SELECTED GROUPS

| Category | Collision Rate (Collisions Per Million Vehicle Kilometres) Including All Intersections | Signalized Intersections Not Included | Intersections Not Included |
|---|---|---|---|
| All Arterials 1984 | 3.34 | 2.31 | 1.42 |
| All Arterials 1983 | 3.34 | 2.30 | 1.38 |
| All Arterials 1982 | 3.59 | 2.47 | 1.48 |
| All Arterials 1981 | 4.04 | 2.69 | 1.66 |
| All Arterials 1980 | 4.00 | 2.65 | 1.61 |
| All Arterials 1979 | 4.33 | 2.90 | 1.76 |
| All Arterials 1978 | 4.06 | 2.77 | 1.63 |
| All Arterials 1977 | 4.74 | 3.25 | 2.01 |
| All Arterials 1980 - 84 | 3.66 | 2.48 | 1.51 |

ROADWAY SECTION COLLISION RATES, INCLUDING ALL INTERSECTIONS, HAVE DISPLAYED A DECLINE FROM 1977 - 1984.

ROADWAY SECTION COLLISION RATES, EXCLUDING SIGNALIZED INTERSECTIONS, HAVE DISPLAYED A DECLINE FROM 1977 - 1984.

ROADWAY SECTION COLLISION RATES, EXCLUDING THE EFFECTS OF ALL INTERSECTIONS, HAVE DISPLAYED A DECLINE FROM 1977 - 1984.

# Appendix

Exhibit A-1

## CAUSES OF DEATH 1980 (1)

| Cause | Rate/100,000 Population Canada | Ontario |
|---|---|---|
| Diseases of the Heart and Circulatory Diseases | 323.6 | 345.9 |
| All Malignant Neoplasms | 165.2 | 167.0 |
| All Accidents and Adverse Effects (Including Late Effects) | 65.7(2) | 56.9 (2) |
| Respiratory Diseases (Excluding Infections and Parasitic Diseases) | 46.7 | 46.5 |
| Diabetes Mellitus | 12.0 | 12.0 |
| Chronic Liver Disease and Cirrhosis | 11.2 | 11.3 |
| Causes of Perinatal Mortality Excluding Stillbirths | 6.9 | 6.2 |
| Congenital Anomalies | 6.7 | 6.1 |
| All Other Causes Not Specified in the Above List | 77.8 | 79.8 |
| All Causes | 715.8 | 731.7 |

NOTES:

(1) From Statistics Canada, Vital Statistics, Volume III, Mortality, 1979 and 1980, p. 12-15.

(2) Motor Vehicle Collisions Alone - 22.5 for Canada, 17.8 for Ontario.

Exhibit A-2

## ACCIDENTAL CAUSES OF DEATH 1980 (1)

| Cause | Number | | Death Rate/100,000 | |
|---|---|---|---|---|
| | Canada | Ontario | Canada | Ontario |
| Traffic Accidents | 5,397 | 1,527 | 22.5 | 17.8 |
| Accidental Falls | 1,848 | 663 | 7.7 | 7.7 |
| Fires | 747 | 229 | 3.1 | 2.7 |
| Drowning | 570 | 150 | 2.4 | 1.7 |
| Other Transport | 548 | 194 | 2.3 | 2.3 |
| Accidental Poisoning | 443 | 203 | 1.9 | 2.4 |
| Suffocation | 423 | 148 | 1.8 | 1.7 |
| Motor Vehicle (non-traffic related) | 144 | 57 | 0.6 | 0.6 |
| Explosives, Acid, Electricity | 117 | 37 | 0.5 | 0.4 |
| Firearms | 74 | 21 | 0.3 | 0.2 |
| Lightning | 8 | 3 | 0.1 | 0.1 |
| All Other | 908 | 262 | 3.8 | 3.1 |

(1) Statistics Canada, Vital Statistics, Volume III, Mortality, 1979 and 1980, p. 180-183.

Exhibit A-3

## ACCIDENTAL CAUSES OF DEATH 1980 (14 YRS. OF AGE AND UNDER) (1)

| Cause | Number of Fatalities In Canada |
|---|---|
| Traffic Accidents | 559 |
| Fires | 187 |
| Drowning | 171 |
| Suffocation | 98 |
| Other Transport | 35 |
| Accidental Falls | 35 |
| Firearms | 21 |
| Motor Vehicle (Non-Traffic Related) | 21 |
| Accidental Poisoning | 12 |
| Explosives, Acid, Electricity | 9 |
| Lightning | 1 |
| All Other | 147 |

(1) Statistics Canada, Volume III, Mortality, 1979 and 1980, p. 104-106.

Exhibit A-4

## POPULATION AND REGISTRATION

| Year | Population | Motor Vehicle Registration (a) | | Ratio: Motor Vehicle Registration to Population |
|---|---|---|---|---|
| | Hamilton | Ontario | Hamilton | |
| 1950 | n/a | 1,104,080 | 47,043 | |
| 1951 | 201,296 | 1,205.098 | 50,648 | 0.25 |
| 1952 | 210,060 | 1,291,753 | 55,169 | |
| 1953 | 216,921 | 1,406,119 | 59,808 | |
| 1954 | 222,907 | 1,489,980 | 62,728 (b) | |
| 1955 | 225,608 | 1,617,853 | 67,497 | |
| 1956 | 233,019 | 1,710,240 | 70,034 (b) | 0.30 |
| 1957 | 243,097 | 1,793,499 | 72,156 | |
| 1958 | 251,256 | 1,868,922 | 75,763 | |
| 1959 | 258,576 | 1,973,737 | 80,365 | |
| 1960 | 263,750 | 2,062,484 | 82,823 | |
| 1961 | 266,707 | 2,126,270 | 85,667 | 0.32 |
| 1962 | 268,908 | 2,177,148 | 83,779 | |
| 1963 | 264,706 | 2,268,320 | 89,005 | |
| 1964 | 278,260 | 2,381,219 | 93,208 | |
| 1965 | 283,099 | 2,516,680 | 102,171 | |
| 1966 | 285,649 | 2,643,474 | 107,506 | 0.38 |
| 1967 | 291,536 | 2,736,366 | 107,521 | |
| 1968 | 293,397 | 2,869,588 | 116,452 | |
| 1969 | 296,875 | 2,953,789 | 116,135 | |
| 1970 | 298,755 | 3,047,599 | 114,760 | |
| 1971 | 303,177 | 3,209,862 | 120,727 | 0.39 |
| 1972 | 304,391 | 3,382,497 | 134,623 (b) | |
| 1973 | 305,382 | 3,583,379 | 140,687 | |
| 1974 | 401,932 (e) | 3,891,603 | 154,886 (d) | |
| 1975 | 408,466 (e) | 4,079,108 | 162,348 (d)(g) | |
| 1976 | 409,331 (e) | 4,089,954 (c) | 162,780 (d) | 0.52 (f) |
| 1977 | 411,358 (e) | 4,274,410 (c) | 170,122 (d) | |
| 1978 | 407,486 (e) | n/a | 228,149 (h) | |
| 1979 | 407,758 (e) | n/a | 190,884 (h) | |
| 1980 | 410,503 (e) | n/a | 230,459 (h) | |
| 1981 | n/a | n/a | 277,813 (h) | 0.68 (j) |
| 1982 | n/a | n/a | 296,288 (h) | |

NOTES:

(a) Registration is for all vehicles including automobiles, station wagons and commercial vehicles. Sources of data, Hamilton Police Reports, R. L. Polk and Company, Statistics Canada and The Ministry of Transportation and Communications of Ontar'o.

(b) Data not available. Estimated from provincial value.

(c) Estimated by the Ministry of Transportation and Communications.

(d) Data estimated from provincial value for City of Hamilton only.

(e) Population for Regional Municipality of Hamilton-Wentworth.

(f) For City of Hamilton only.

(g) R. L. Polk estimate for Region of Hamilton-Wentworth for 1975 - 180,084.

(h) Ministry of Transportation and Communications estimate for Region based on licence sales only, for Regional Hamilton-Wentworth.

(j) For Regional Municipality of Hamilton-Wentworth.

Exhibit A-5

## MOTOR VEHICLE ACCIDENT DEATHS AND RATES

| YEAR | DEATHS | | | RATES/10,000 REGISTERED MOTOR VEHICLES | | |
|---|---|---|---|---|---|---|
| | Canada | Ontario | Hamilton | Canada | Ontario | Hamilton |
| 1931 | 1,316 | 574 | 31 | 10.96 | 10.21 | |
| 1932 | 1,120 | 497 | 20 | 10.05 | 9.35 | |
| 1933 | 955 | 416 | 22 | 8.82 | 8.00 | |
| 1934 | 1,115 | 528 | 27 | 9.82 | 9.74 | |
| 1935 | 1,224 | 571 | 16 | 10.42 | 10.12 | |
| 1936 | 1,316 | 564 | 23 | 10.61 | 9.56 | |
| 1937 | 1,642 | 774 | 39 | 12.37 | 12.41 | |
| 1938 | 1,545 | 677 | 33 | 11.08 | 10.12 | |
| 1939 | 1,584 | 682 | 35 | 11.01 | 9.99 | n/a |
| 1940 | 1,723 | 756 | 46 | 11.46 | 10.74 | |
| 1941 | 1,852 | 835 | 45 | 11.78 | 11.30 | |
| 1942 | 1,409 | 610 | 49 | 9.24 | 8.53 | |
| 1943 | 1,437 | 563 | 41 | 9.51 | 8.14 | |
| 1944 | 1,374 | 526 | 28 | 9.14 | 7.79 | |
| 1945 | 1,556 | 637 | 25 | 10.39 | 9.61 | |
| 1946 | 1,781 | 729 | 33 | 10.98 | 10.25 | |
| 1947 | 1,869 | 753 | 26 | 10.17 | 9.41 | |
| 1948 | 2,086 | 782 | 19 | 10.25 | 8.94 | 5.34 |
| 1949 | 2,265 | 873 | 29 | 9.89 | 9.00 | n/a |
| 1950 | 2,270 | 850 | 12 | 8.74 | 7.70 | 2.55 |
| 1951 | 2,686 | 991 | 26 | 9.36 | 8.22 | 5.13 |
| 1952 | 2,701 | 1,040 | 26 | 8.56 | 8.05 | 4.71 |
| 1953 | 2,906 | 1,082 | 17 | 8.47 | 7.69 | 2.84 |
| 1954 | 1,960 (a) | 1,045 | 17 | 5.38 (a) | 7.01 | 2.71 |
| 1955 | 2,084 (a) | 1,111 | 15 | 5.28 (a) | 6.87 | 2.22 |
| 1956 | 3,184 | 1,180 | 25 | 7.46 | 6.90 | 3.57 |
| 1957 | 3,260 | 1,279 | 25 | 7.25 | 7.13 | 3.46 |
| 1958 | 3,118 | 1,112 | 21 | 6.61 | 5.94 | 2.77 |
| 1959 | 3,231 | 1,187 | 18 | 6.44 | 6.01 | 2.24 |

| YEAR | DEATHS | | | RATES/10,000 REGISTERED MOTOR VEHICLES | | |
|---|---|---|---|---|---|---|
| | Canada | Ontario | Hamilton | Canada | Ontario | Hamilton |
| 1960 | 3,283 | 1,166 | 21 | 6.25 | 5.65 | 2.54 |
| 1961 | 3,426 | 1,286 | 19 | 6.21 | 6.05 | 2.22 |
| 1962 | 3,883 | 1,383 | 32 | 6.72 | 6.35 | 3.82 |
| 1963 | 4,210 | 1,421 | 27 | 6.93 | 6.26 | 3.03 |
| 1964 | 4,652 | 1,424 | 32 | 7.29 | 5.98 | 3.43 |
| 1965 | 4,902 | 1,611 | 27 | 7.31 | 6.40 | 2.64 |
| 1966 | 5,281 | 1,596 | 28 | 7.51 | 6.04 | 2.60 |
| 1967 | 5,429 | 1,719 | 39 | 7.26 | 6.28 | 3.63 |
| 1968 | 5,318 | 1,586 | 22 | 6.74 | 5.53 | 1.89 |
| 1969 | 5,425 | 1,683 | 19 | 6.57 | 5.70 | 1.64 |
| 1970 | 5,080 | 1,535 | 23 | 5.97 | 5.04 | 2.00 |
| 1971 | 5,573 | 1,769 | 23 | 6.17 | 5.51 | 1.91 |
| 1972 | 6,221 | 1,934 | 46 | 6.56 | 5.72 | 3.42 |
| 1973 | 6,706 | 1,959 | 23 | 6.60 | 5.47 | 1.63 |
| 1974 (b) | 6,290 | 1,748 | 31 | 5.72 | 4.49 | 2.00 |
| 1975 | 6,061 | 1,800 | 26 | 5.29 | 4.41 | 1.60 |
| 1976 | | 1,511 | 29 | | 3.70 | 1.78 |
| 1977 | n/a | 1,420 | 34 | n/a | 3.27 | 2.00 |
| 1978 | | 1,450 | 47 | | 3.23 | 2.06 |
| 1979 | | 1,560 | 42 | | 3.36 | 2.20 |
| 1980 | | 1,508 | 33 | | 3.17 | 1.43 |
| 1981 | | 1,445 | 31 | | 2.86 | 1.16 |
| 1982 | | 1,138 | 23 | | 1.88 | 0.77 |
| 1983 | | 1,204 | 20 | | | n/a |
| 1984 | | | 18 | | | |

(a) Except Quebec.

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-6

## HAMILTON/HAMILTON-WENTWORTH PEDESTRIAN INJURY RATES HISTORIC TRENDS

| YEAR | PEDESTRIAN | |
|---|---|---|
| | Injuries Per 1,000 Population | Fatalities Per 100,000 Population |
| 1951 | 1.41 | 7.45 |
| 1952 | 2.13 | 6.19 |
| 1953 | 2.14 | 4.14 |
| 1954 | 1.97 | 5.83 |
| 1955 | 2.29 | 3.10 |
| 1956 | 1.92 | 9.01 |
| 1957 | 2.16 | 6.17 |
| 1958 | 1.78 | 5.57 |
| 1959 | 1.76 | 5.03 |
| 1960 | 1.60 | 4.93 |
| 1961 | 1.96 | 4.12 |
| 1962 | 1.84 | 4.83 |
| 1963 | 2.11 | 5.67 |
| 1964 | 1.89 | 7.19 |
| 1965 | 2.05 | 6.00 |
| 1966 | 2.07 | 5.95 |
| 1967 | 1.89 | 5.83 |
| 1968 | 2.11 | 3.41 |
| 1969 | 2.03 | 2.02 |
| 1970 | 1.81 | 4.69 |
| 1971 | 1.84 | 4.29 |
| 1972 | 1.76 | 6.90 |
| 1973 | 1.87 | 2.95 |
| 1974 (a) | 1.41 | 3.23 |
| 1975 | 1.28 | 2.69 |
| 1976 | 1.18 | 3.42 |
| 1977 | 1.22 | 2.43 |
| 1978 | 1.34 | 6.14 |
| 1979 | 1.14 | 3.68 |
| 1980 | 1.03 | 2.93 |
| 1981 | 1.13 | 2.50 |
| 1982 | 1.00 | 2.46 |
| 1983 | 0.95 | 1.23 |
| 1984 | 0.77 | 1.47 |

Note: See also Exhibit 1-2

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-7

## TRENDS DATA
## REGRESSION EQUATIONS

| Statistic | Years | Equation (a) | Significant Slope at 95% | 99% (b) | Range of Significant Slope at 95% |
|---|---|---|---|---|---|
| 1. Collision Rate - All (c) | 1951 - 1984 | y = -0.208 x + 29.87 | Yes | No | -0.006 to -0.409 |
| 2. Collision Rate - All (c) | 1965 - 1984 | y = -0.907 x + 34.71 | Yes | Yes | -0.741 to -1.074 |
| 3. Injury Collision Rate | 1954 - 1984 | y = 0.077 x + 6.41 | Yes | No | 0.136 to 0.180 |
| 4. Injury Collision Rate | 1965 - 1984 | y = -0.138 x + 9.87 | Yes | Yes | -0.084 to -0.191 |
| 5. Personal Injury Rate | 1951 - 1984 | y = 0.193 x + 6.68 | Yes | Yes | 0.270 to 0.115 |
| 6. Personal Injury Rate | 1963 - 1984 | y = -0.115 x + 13.21 | Yes | No | -0.028 to -0.201 |
| 7. Pedestrian Injury Rate | 1951 - 1984 | y = -0.033 x + 2.25 | Yes | Yes | -0.023 to -0.043 |
| 8. Fatality Rate - All Collisions | 1951 - 1984 | y = -0.092 x + 10.39 | Yes | No | -0.005 to -0.180 |
| 9. Pedestrian Fatality Rate | 1951 - 1984 | y = -0.122 x + 6.65 | Yes | Yes | -0.711 to -0.174 |

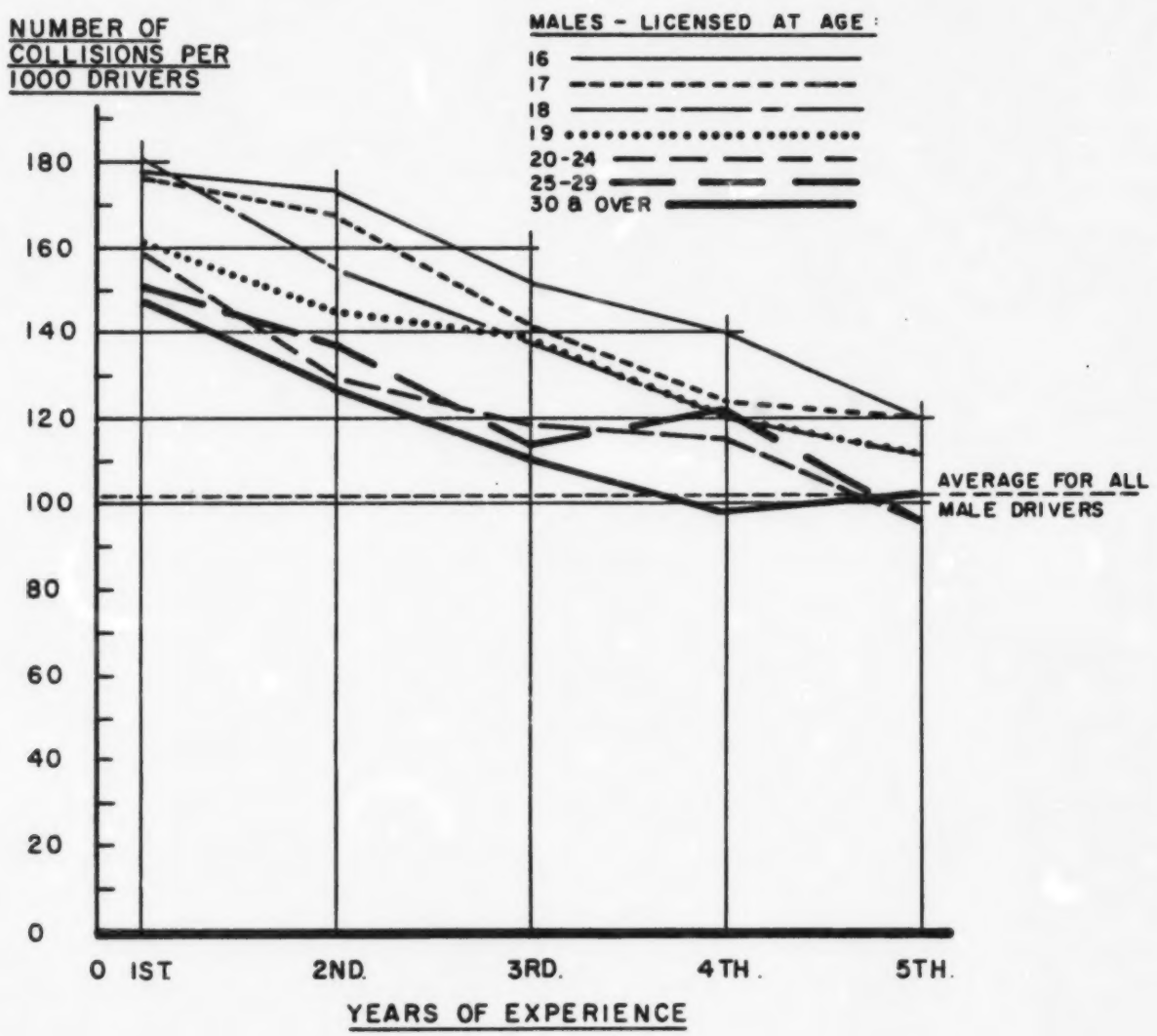
(a) The variable "x" represents the year; "y" the number of collisions expected.
"x" is 1.0 for the first year included in the equation.
"y" is in collisions per 1,000 population for 1 and 2; in injuries per 1,000 population for 3, 4 and 5; and in fatalities per 100,000 population in 6 and 7.

(b) If the slope of the regression line is significant, we can state with the indicated level of confidence that the slope is not equal to zero.

(c) Includes changes in reporting criteria and reporting area. For this reason, conclusions drawn from this regression line may not be entirely meaningful or appropriate.

APPENDIX A-8

## EFFECT OF EXPERIENCE ON COLLISION INVOLVEMENT OF NEW DRIVERS




SOURCE - SYSTEMS RESEARCH & DEVELOPMENT,
ONTARIO MINISTRY OF TRANSPORTATION & COMMUNICATIONS

Exhibit A-9

## COLLISION STATISTICS - SELECTED CANADIAN CITIES

| City or Regional Municipality | Population | Property Damage Only - Collision Reporting Level | Collision Reporting Criteria (1) (a) | (b) | (c) | (d) | Other | Total Collisions | Collisions/ 1,000 Population | Injury Collisions | Injury Collisions/ 1,000 Population |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Regional Hamilton-Wentworth | 407,000 (1982) | $400.00 | No | No | Yes | Yes | (f) | 7,228 | 17.8 | 2,744 | 6.7 |
| City of Hamilton | 308,402 (1982) | $400.00 | No | No | Yes | Yes | (f) | 5,797 | 18.8 | 2,185 | 7.1 |
| Burlington | 117,000 (1984) | $400.00 | No | No | No | Yes | (f) | 1,653 | 14.1 | 593 | 5.1 |
| Calgary | 619,815 (1984) | $500.00 | Yes | Yes | Yes | Yes | (f) | 32,840 | 53.0 | 1,921 | 3.1 |
| Edmonton | 560,085 (1983) | $500.00 | No | No | No | Yes | | 19,469 | 34.8 | 4,393 | 7.8 |
| Halifax | 114,594 (1981) | $500.00 | Yes | Yes | Yes | Yes | | 4,726 | 41.2 | 616 | 5.4 |
| London | 268,051 (1983) | $400.00 | Yes | Yes | Yes | Yes | (f) | 6,404 | 23.9 | 2,124 | 7.9 |
| City of Montreal | 1,020,720 (1983) | $250.00 | No | No | No | Yes | | 26,038 (g) | 25.5 | 6,735 | 6.6 |
| Regional Ottawa-Carleton | 585,398 (1984) | $400.00 | No | No | No | Yes | | 15,907 | 27.2 | 4,295 | 7.3 |
| Regina(2) | 173,400 (1984) | $500.00 | No | No | No | Yes | | 7,029 | 40.5 | 1,398 | 8.1 |
| Saskatoon | 170,748 (1984) | $500.00 | No | No | No | Yes | | 7,700 | 45.1 | 770 | 4.5 |
| Metro Toronto(3) | 2,137,960 (1983) | $700.00 | Yes | Yes | Yes | Yes | (e)(f) | 51,925 | 24.3 | 15,330 | 7.2 |
| Vancouver | 416,139 (1984) (h) | $400.00 | No | No | Yes | Yes | | 23,767 | 57.1 | 2,618 | 6.3 |
| Windsor | 192,546 (1982) | $400.00 | Yes | Yes | Yes | Yes | | 4,991 | 25.9 | 1,786 | 9.3 |
| Winnipeg | 604,627 (1984) | $500.00 | Yes | Yes | Yes | Yes | | 18,293 | 30.3 | 4,416 | 7.3 |

(1) KEY TO CRITERIA FOR REPORTING COLLISIONS (See next page for definition of injury collisions)
It is generally assumed, unless otherwise noted, that only collisions occurring on public roadways involving personal injury or property damage greater than the reporting level are included on this table.
(a) Collisions reported involving an infraction of the Provincial Highway Traffic Act with property damage only and less than reporting level.
(b) Collisions reported involving an infraction of the Criminal Code of Canada with property damage only and less than reporting level.
(c) Hit and run collisions reported with property damage only and less than reporting level.
(d) Collision reported if it involves any personal injury.
(e) Public property damage collisions.
(f) Collisions involving City or Regional government vehicles.
(g) "With the introduction of amicable constat by insurance companies in July, 1979, a great number of accidents with material damages are not reported and are out of control".
(h) estimated.

(2) Only injuries requiring medical attention were classified as injury collisions.

(3) Injury collisions do not include fatal accidents.

## DEFINITIONS OF "PERSONAL INJURY" (a)

| | |
|---|---|
| Regional Hamilton-Wentworth | - any bodily harm, visible or complained of, that results from a motor vehicle collision. |
| City of Hamilton | - any bodily harm, visible or complained of, that results from a motor vehicle collision. |
| Burlington | - any bodily harm, visible or complained of, that results from a motor vehicle collision. |
| Calgary | - any type of injury resulting from a collision. |
| Edmonton | - includes minor abrasions and bruises, complaint of pain, caused by a motor vehicle collision. |
| Halifax | - injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision. |
| London | - any type of injury caused by a collision; need not be treated at a hospital. |
| City of Montreal | - any injury, apparent or not, to any person, caused directly or indirectly, by a motor vehicle. |
| Regional Ottawa-Carleton | - injury is any bodily harm visible or complaint of, caused by a motor vehicle collision. |
| City of Regina | - any bodily harm, visible or complaint of, caused by the accident. |
| Saskatoon | - any bodily harm, visible or complaint of, caused by a collision. |
| Metro Toronto | - injury must be reported when an injury occurs to any of the involved persons in a collision. |
| Vancouver | - up to discretion of driver or police if in attendance. |
| Windsor | - any injury resulting from a motor vehicle collision. |
| Winnipeg | - readily identifiable injury or perceived injury caused by a collision. |

(a) definitions of a "personal injury" such that a collision involving a personal injury must be reported.

Exhibit A-10

## FATAL COLLISION STATISTICS - CANADIAN AND U.S. CITIES - 1983 (1)

| CITY | # OF FATALITIES 1983 | RATE PER 100,000 POPULATION | RATE PER 10,000 REGISTERED VEHICLES |
|---|---|---|---|
| **HAMILTON (2)** | **10** | **5.9** | **1.2** |
| AVERAGE OF ALL U.S. CITIES, POPULATION 200,000 - 350,000 REPORTING TO N.S.C. (26 CITIES) | 37.3 | 13.8 | 2.0 |
| Rochester, N.Y. | 13 | 5.4 | 0.8 |
| Norfolk, Va. | 16 | 5.7 | 1.2 |
| St. Paul, Minn. | 19 | 7.2 | 1.0 |
| Shreveport, La. | 15 | 7.4 | 1.0 |
| Oakland, Cal. | 29 | 8.6 | 1.4 |
| Richmond, Va. | 21 | 9.6 | 1.6 |
| Charlotte, N.C. | 29 | 9.7 | 1.8 |
| Wichita, Kans. | 27 | 10.1 | 1.1 |
| Tulsa, Okla. | 34 | 10.3 | 1.5 |
| Albuquerque, N.M. | 33 | 11.2 | 1.6 |
| Anaheim, Cal. | 24 | 11.6 | 1.4 |
| Louisville, Ky. | 39 | 12.3 | 1.5 |
| Virginia Beach, Va. | 31 | 12.6 | 3.0 |
| Akron, Ohio | 32 | 13.4 | 1.7 |
| Long Beach, Cal. | 48 | 14.1 | 2.1 |
| Sacramento, Cal. | 40 | 14.6 | 1.8 |
| Birmingham, Ala. | 43 | 15.3 | 2.0 |
| Mobile, Ala. | 34 | 16.4 | 3.0 |
| Austin, Tex. | 53 | 16.6 | 3.1 |
| Baton Rouge, Ca. | 54 | 17.4 | 3.7 |
| Tucson, Ariz. | 59 | 17.8 | 2.6 |
| Anchorage, Alas. | 37 | 18.3 | 2.0 |

| CITY | # OF FATALITIES 1983 | RATE PER 100,000 POPULATION | RATE PER 10,000 REGISTERED VEHICLES |
|---|---|---|---|
| Corpus Christie, Tex. | 41 | 19.1 | 3.2 |
| Miami, Fla. | 67 | 19.3 | 2.4 |
| St. Petersburg, Fla. | 53 | 22.9 | 2.6 |
| Tampa, Fla. | 80 | 30.3 | 3.5 |

NOTE:

(1) SOURCE: Accident Facts, 1984 Edition, National Safety Council, 444 N. Michigan Avenue, Chicago, Ill. Please note statistics are for 1983 calendar year.

(2) Rate is for City of Hamilton only.